



U.S. Department of Energy
Office of River Protection

P.O. Box 450, MSIN H6-60
Richland, Washington 99352

NOV 24 2004

04-TF-025

Mr. E. S. Aromi, President
and General Manager
CH2M HILL Hanford Group, Inc.
Richland, Washington 99352

Dear Mr. Aromi:

CONTRACT NO. DE-AC27-99RL14047 – SUBMITTAL OF THE PRE-IMPLEMENTATION
PORTION OF THE INTEGRATED SAFETY MANAGEMENT (ISM) IMPROVEMENT
VALIDATION AT THE HANFORD TANK FARM FINAL REPORT

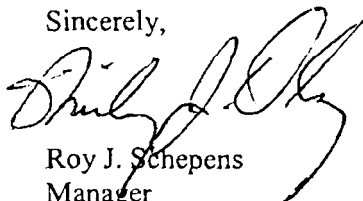
The attached Report of the Pre-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm, Final Report, dated November 8, 2004, is being submitted to CH2M HILL Hanford Group, Inc. (CH2M HILL) for review.

The report concludes that CH2M HILL has identified required improvements in ISM, and that the current path forward can be successful in achieving these improvements. However, significant management team in-field presence and involvement, and worker buy-in will be necessary to achieve improvement objectives.

The validation team identified eight Findings requiring resolution. The validation team noted some uncertainty in timely corrective action implementation being able to support the CH2M HILL February 2005 midpoint assessment, and the March 2005 U.S. Department of Energy validation. Please advise me of the actions you are taking to assure timely and effective completion of corrective actions. CH2M HILL should respond to these Findings, identifying corrective actions to be taken within 30 days from the date of this letter.

If you have any questions, please contact me, or your staff may contact T. Zack Smith, Acting Assistant Manager for Tank Farms, (509)372-9735.

Sincerely,


Roy J. Schepens
Manager

TF:TZS

Attachment

cc w/attach:

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R. A. Dodd, CH2M HILL
R. L. Higgins, CH2M HILL
V. M. Pizzuto, CH2M HILL

P. M. Golan, EM-1
I. R. Triay, EM-3
P. M. Bubar, EM-3.2
M. T. Sautman, RL

**Attachment
04-TF-025**

**Report of the Pre-Implementation Portion of the Integrated Safety Management
Improvement Validation at the Hanford Tank Farm**

(79 pages total,
including coversheet)

**Report of the Pre-Implementation Portion of the
Integrated Safety Management Improvement Validation at the
Hanford Tank Farm**

November 8, 2004

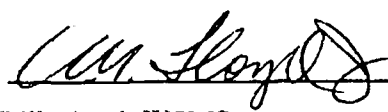
FINAL REPORT

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

TEAM MEMBER APPROVAL



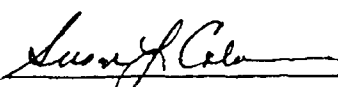
Frank McCoy, WSMS (Team Lead)



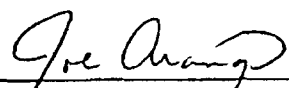
Bill Lloyd, WSMS



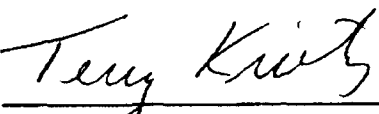
Mark Brown, DOE-ORP



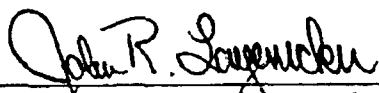
Susan J. Coleman, DOE-ORP



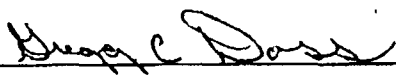
Joe Arango, DOE-EM



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Gregg Doss, HAMTC Representative

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List of Acronyms, Abbreviations, and Units

ACL	Administrative Control Level
AJRG	ALARA Joint Review Group
ALARA	As Low As Reasonably Achievable
BNI	Bechtel National, Inc.
CA	Contaminated Area
CCA	Common Cause Analysis
CFR	Code of Federal Regulations
COB	Clean-out Box
DEAR	Department of Energy Acquisition Regulations
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
ESH&Q	Environmental, Safety, Health and Quality
EM	Office of Environmental Management
EWP	Enhanced Work Planning
FWS	Field Work Supervisor
HAMTC	Hanford Atomic Metal Trades Council
HRA	High Radiation Area
IH	Industrial Hygiene
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
LLCE	Long Length Contaminated Equipment
NCO	Nuclear Chemical Operator
ORP	Office of River Protection
ORPS	Occurrence Reporting and Processing System
PER	Problem Evaluation Request
PPE	Personal Protection Equipment
RCA	Root Cause Analysis
RCT	Radiological Control Technician
RWP	Radiological Work Permit
SSW	Senior Supervisory Watch
TFC	Tank Farm Contractor
TUF	Track Until Fit
WSMS	Washington Safety Management Solutions
WTP	Waste Treatment and Immobilization Plant

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EXECUTIVE SUMMARY

From October 18, 2004, to October 28, 2004, a review team, chartered by the U.S. Department of Energy (DOE) Office of River Protection (ORP) conducted the pre-implementation portion of an Integrated Safety Management (ISM) Improvement Validation of Tank Farms Contractor (TFC) activities at the Hanford Site Tank Farms. This pre-implementation review focused on the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. The review assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness. A post-implementation review, which will be conducted following corrective action implementation, will assess corrective action implementation effectiveness.

This report describes the results, conclusions and findings of the pre-implementation review portion of the ISM Improvement Validation.

Background

This ISM Improvement Validation effort was commissioned by ORP as recommended in the report of the *Integrated Safety Management System Assessment for the U.S. Department of Energy Office of River Protection*, dated August 2004. The results of the Improvement Validation will also be used to address concerns raised by the Defense Nuclear Facilities Safety Board (DNFSB) in their September 8, 2004, letter to the Acting Assistant Secretary for Environmental Management. These concerns involved, for the most part, incidents that have occurred at the Hanford Tank Farm over the past fifteen months.

ISM Improvement Validation Process

Under the current contract, the TFC, CHM2 HILL Hanford Group, Inc., implemented its Integrated Safety Management System (ISMS) and DOE then verified that the system was implemented, and approved the ISMS Program Description in June 2000. Subsequent annual assessments of the ISMS occurred in April 2001 and September 2002. The ISMS Program Description was updated several times and the last DOE approval of updates occurred in March 2003. In August 2004, ORP performed an ISM focused review in response to the DOE Office of Environmental Management (EM) direction for each operations office to declare the status of their ISMS. As a result of that review, it was recommended that an ISM Improvement Validation be performed to examine the effectiveness of corrective actions taken in response to recent incidents. The review documented in this report is the pre-corrective action implementation review of this Validation. A post-corrective action implementation review is currently scheduled to be accomplished in March 2005.

The purpose of this pre-implementation review of the ISM Improvement Validation is to ascertain causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness for the following incidents:

- the 244-CR vault incident;

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- the six incidents (including the 244-CR incident delineated above) addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004;
- the S-112 transfer incident; and
- other incidents specified by ORP.

The ISM Improvement Validation team members were selected based on their significant relevant experience in ISM, nuclear safety and operation, safety health and quality programs, radiological control, project management, and work control.

The approach for this pre-implementation review consisted of the following elements with respect to the incidents specified above:

- Review of ORP, DNFSB, and TFC correspondence, selected past and recent documented ISMS reviews, and the TFC compensatory measures document (TFC-MD-038, *Compensatory Controls for Radiological Control Performance*).
- Review of Occurrence Reports, Problem Evaluation Requests, and Price Anderson Amendments Act Nuclear Tracking System Reports.
- Review of documented Causal Analyses.
- Review of Corrective Action Plans.
- Interviews of project and program level personnel responsible for the causal analyses and corrective action determinations.
- Interviews of project and program level personnel responsible for compensatory measure determination and implementation, and corrective action implementation.
- Interviews with selected first line supervisors and groups of hourly workers.
- Observation of selected work planning meetings, As Low As Reasonably Achievable (ALARA) reviews, Plan of the Day meetings, morning meetings, and pre-job briefings.
- Observation of selected compensatory measure implementation meetings.
- Observation of selected post-job debriefings

The review team observed three pre-job briefings, four work planning meetings, three work release/plan of the day meetings, an ALARA Joint Review Group meeting, and an intermediate post-job review. Over 125 personnel were interviewed, including 11 Nuclear Chemical Operators, 10 craft personnel, 20 first line supervisors, 26 technicians, 36 engineers and managers, and the President and Vice Presidents of the TFC. The team reviewed 48 documents, including procedures, problem evaluation requests, occurrence reports, event investigation reports, non-compliance tracking system reports, management and independent assessment reports, external review reports, and various types of formal correspondence.

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Results

The team generally concurred with the corrective actions identified in the 244-CR Vault event root cause analysis and the compensatory measures described in the TFC's management directive, MD-038. The team did, however, identify eight Findings related to work planning, management programs (including feedback and improvement), and the CR Vault corrective action plan:

- Finding 1: Worker involvement in work planning appears to be less than effective.
- Finding 2: Job Hazard Analyses reviewed do not provide a job-specific, work step analysis of hazards.
- Finding 3: Management expectations regarding major issues, their significance, and changes required for resolution of these issues were not consistent and a single, simple, unified message of "what needs to change and why" was not communicated by management.
- Finding 4: Some deficiencies were identified with the corrective actions detailed in the 244-CR Vault event root cause analysis.
- Finding 5: The radiological event common cause analysis report transmitted to DOE on September 30, 2004, did not systematically identify which causes were substantially common to a majority of those events, and did not identify the analytical basis for conclusions reached other than through employee interviews.
- Finding 6: The TFC has not corrected the record (formal correspondence) regarding the submission of a radiological event common cause analysis.
- Finding 7: Inadequacies identified in the critique of the CR Vault event were not formally identified, nor were corrective actions taken as a result of the poor critique.
- Finding 8: First line supervisors and their work crews demonstrated weaknesses in level of knowledge in the practical application of radiological controls for ionizing radiation (including fundamentals and limitations). Additionally, some first line supervisors were unable to clearly articulate Conduct of Operations and ISMS attributes.

Conclusions

The team considers that the TFC has identified required improvements in ISM and that the TFC's current path forward can be successful. However, significant management team in-field presence and involvement and worker buy-in will be necessary to achieve improvements.

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to document the results of the pre-implementation review portion of an Integrated Safety Management (ISM) Improvement Validation of Tank Farm contractor (TFC) activities at the Hanford Site Tank Farms in the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. This pre-implementation review assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness. A post-implementation review, which will be conducted following implementation of corrective actions, will assess the effectiveness of the actions.

1.2 Background

The Hanford Site is located in southeastern Washington State and contains a large concentration of radioactive waste that is the legacy of 45 years of plutonium production for nuclear weapons. The plutonium production mission began with the Manhattan Project in the 1940s, continued through most of the Cold War, and concluded in 1989. Two hundred thousand cubic meters (53 million gallons) of high-level radioactive waste were stored in 177 underground tanks, 149 of which are older single shell tanks. Sixty-seven of the 149 older single-shell tanks have leaked an estimated 3800 cubic meters (1 million gallons) of waste to the soil. Some of that waste has been detected in the groundwater that flows to the Columbia River seven miles away. Efforts are underway to reduce the risk of future leaks from the tanks.

In May 1989, the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency, and the State of Washington Department of Ecology signed a comprehensive Hanford Site cleanup and compliance agreement entitled the *Hanford Federal Facility Agreement and Consent Order*, commonly referred to as the Tri-Party Agreement. This agreement includes legally enforceable commitments and milestones on storing, treating and disposing of the tank waste.

Cleanup of Hanford Site tank waste will require the Tank Farms to function as part of a waste treatment complex. The Tank Farms must be (1) safely and efficiently operated, and maintained to store the waste to be treated, and (2) upgraded and operated to retrieve the waste and deliver it to the treatment plant. Many of the tank and waste transfer systems needed to support future retrieval of waste for treatment are well beyond their design life.

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To accomplish the DOE mission, Office of River Protection (ORP) was established to operate as a single, integrated project. ORP and its two main contractors are responsible for performing work necessary to complete the mission. The first is the TFC, CH2M HILL Hanford Group, Inc., responsible for ensuring safe storage, retrieval, storage and disposal of the immobilized waste, decontamination and decommissioning, and initiation of post closure monitoring of the tank farms. The second is a contractor (Bechtel National, Inc. [BNI]) responsible for designing, constructing, commissioning, and supporting the transition of the Waste Treatment and Immobilization Plant (WTP).

The TFC is responsible for safe storage and retrieval for treatment of the approximately 53 million gallons of highly radioactive and hazardous waste stored in the 177 large underground tanks. In January 2001, the TFC signed a six-year \$2.2 billion contract extension with ORP to perform \$2.5 billion worth of work, with a key feature of this contract extension being the inclusion of specific performance-based incentives. In 2003, the contract was further renegotiated to further optimize Tank Farm resources and priorities towards acceleration of the EM mission.

The TFC is responsible for interfacing and coordinating with other Hanford Site prime contractors in the performance of this work. They are required to ensure that requirements for services provided by them to other Hanford Site contractors and received by them from other site contractors are integrated with other Hanford Site contractors and provided for in the baseline.

The TFC is required to conduct business to achieve the following outcomes:

- Maintain Tank Farm waste and infrastructure in a safe environmentally compliant and stable configuration.
- Retrieve tank wastes to the extent needed for tank closure and deliver to the WTP contractor for treatment and immobilization.
- Properly dispose of the immobilized low-activity waste fraction either onsite or offsite.
- Store, on an interim basis, the immobilized high-level waste fraction until it can be shipped offsite for disposal (planned for the Yucca Mountain geologic repository).
- Efficiently and cost effectively close all Hanford Tank Farms.

Achievement of these outcomes must fully consider protection of worker safety and health, public safety and health, and the environment; effective leadership and management; management responsiveness to customers; responsive communications with external and internal Hanford customers; and proficient partnering with other Hanford Site prime contractors.

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The TFC is required to integrate safety and environmental awareness into all activities, including those of subcontractors at all levels consistent with ISM principles. Work must be accomplished in a manner that achieves high levels of quality, protects the environment, the safety and health of workers and the public, and complies with requirements. The TFC is also required to identify hazards, manage risks, identify and implement good management practices, and make continued improvements in environment, safety, health, and quality (ESH&Q) performance.

The TFC is contractually required to accomplish its mission in a safe, compliant and efficient manner. Key ESH&Q considerations are addressed in the following sections of the contract:

- Section C.2(d), *Environment, Safety, Health and Quality (ESH&Q)*
- Section H.15, *Emergency Clause*
- Section H.16, *Shutdown Authorization*
- Section H.31, *Subcontractor Environment, Safety, Quality, and Health Requirements*
- Section I.108, DEAR 970.5204-2, *Laws, Regulations, and DOE Directives (DEC 2000)*
- Section I.116, DEAR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution (DEC 2000)*
- Section J, Attachment C, *DOE Directives and Attachment F, Environment, Safety, and Health Budget Planning and Execution*

2.0 INTEGRATED SAFETY MANAGEMENT IMPROVEMENT VALIDATION PROCESS

DOE has established the expectation that each contractor will develop and implement an Integrated Safety Management System (ISMS) for conducting work safely as described in DOE Policy 450.4, *Safety Management System Policy*, and the associated guide, DOE G 450.4-1A, *Integrated Safety Management System Guide*. The expectations and essential attributes for ISM are also described in the U.S. Department of Energy Acquisition Regulations (DEAR) contract clauses, 48 Code of Federal Regulations (CFR) 970.5223-1 and 970.5204-2. These require the contractor to integrate ESH&Q into work planning and execution, comply with Federal, State, and local laws and regulations, and comply with DOE contractual requirements. The contract clauses allow for tailoring of the contract requirements to ensure a safety management system suitable to a site's mission. The policy and the DEAR clauses require that the contractor develop a description of the ISMS for approval by DOE. The contractor is then required to implement the system defined in the approved description. Once the contractor determines that they have implemented the ISMS in compliance with the approved description and meet the expectations of the Policy, DOE conducts a verification of the adequacy of the ISMS that the contractor has implemented.

Under the current contract, the TFC implemented its ISMS and DOE then verified that the system was implemented and approved the ISMS Program Description in June 2000. Subsequent annual assessments of the ISMS occurred in April 2001 and September 2002. The ISMS Program Description was updated several times and the last DOE approval of updates occurred in March 2003.

Over the past fifteen months, the TFC has experienced a number of incidents at the Hanford Site Tank Farms that indicate weakness in their implementation of the ISMS; particularly in the areas of work planning, conduct of operations, and some management programs, including feedback and improvement. These incidents include:

The June 25, 2003, AW-01A Pit Transfer Jumper Removal resulting in personnel contamination

During removal of an old waste transfer jumper from the AW-01A pit, a loss of contamination control resulted in personnel exposure to chemical and radiological contamination. Two workers had skin contamination on the face and twelve workers had positive nasal smears.

Prior to this job, which was in support of pit upgrades, 18 of 37 pit upgrades were completed without any personnel contamination problems. Contamination control methods (use of fixative prior to cover block removal and water mist during work) had been successful on prior jobs and a generic Enhanced Work Planning (EWP) was used for a group of pit jobs with similar tasks. Based on prior successes and radiation surveys of the pit, respiratory protection was not required for the AW-01A work.

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The jumper was being sleeved as it was removed from the pit by crane. Dry powder fell out of the jumper internals to the pit floor, causing airborne contamination in the immediate area and contamination spread outside the pit. Water mist was used in an attempt to keep contamination down, but the jumper internals were not wetted. Once the Radiological Control Technician (RCT) found contamination on the windbreak around the pit, the Field Work Supervisor (FWS) made the decision to put the job in safe condition - the jumper removal was completed and the jumper was bagged. At this point, some of the workers were determined to be contaminated.

The November 14, 2003, C-106 Eductor Removal resulting in an individual exceeding administrative radiation exposure limits

The eductor assembly was 40 feet long and weighed 3,000 pounds. The eductor removal work was attempted twice using a crane to pull the eductor into a containment sleeve.

During the first removal, the eductor lifting was stopped due to increasing load because the mixing nozzle interfered with the bottom of the tank riser. The radiation levels exceeded the Radiological Work Permit (RWP) void limit of 50 Rad per hour (Rad/hr) primarily due to high energy beta. The radiation monitoring instruments used to measure the dose rate were at full scale and the higher range instrument was not available at the work location. The work crew stayed clear of the high radiation location but continued work to investigate the cause of the interference and attempted to free the eductor. The eductor was lowered back into the tank and the job suspended after discussions prompted by the ORP Facility Representative related to the RWP void limit. The Conduct of Operations issues related to this were:

- *The proper radiation monitoring instrument used for dose control was not available at the job location, and*
- *The crew continued to work after exceeding the RWP limit until prompted by the ORP Facility Representative.*

The job was re-planned using an in-process As Low As Reasonably Achievable (ALARA) review. The RWP void limit was increased, additional beta shielding (rubber matting) was required, time keeping was required for personnel handling the item, and instruments with a higher range were obtained. The eductor was successfully removed during the second attempt. However, one worker received a whole body dose rate that exceeded the 500 mrem administrative control limit. This was evaluated and found that the dosimeter used by the worker was worn backwards (inadvertently flipped during bending) while performing work.

The May 6, 2004, AP-01A Improper Pressurization Alarm Response;

Two jobs were being performed in 241-AP Tank Farm. Plant Forces were performing work at the AP-03A pit and Construction Forces were installing a jumper at the AP-01A pit per work package 2E-02-0848. Workers at the AP-01A pit had just removed a process blank at Nozzle E and had it suspended from a crane when a pressurization alarm went off. Procedure # ARP-T-271-00103 requires that all workers exit the farm immediately upon receipt of a pressurization alarm. The FWS at the AP-01A pit held a portion of the

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crew on the job to lower the suspended load into the AP-01A pit that he considered was a safe configuration before exiting the farm. The other workers at the AP-03A pit had already exited the farm. A pressurization alarm was not anticipated during either job. Total response time was 20 minutes.

During the fact-finding, it was determined that AP-01A Nozzle E and the drain in AP-03A pit may have been open at the same time and contributed to the pressurization alarm.

A Stop Work was issued regarding the lack of timely egress by employees and responsibility of the change trailer operator during emergency response/egress.

The May 20, 2004, Clean-out Box (COB) AW2 Investigation resulting in unauthorized performance of work

The scope of the work was to investigate whether there was an apparent spill from the SL-167 transfer line after it was discovered that a transfer line was used while the COB was in a state of construction (dismantlement). There was discussion that removing contaminated items if found was not part of the scope of the work and the personal protection equipment (PPE) and void limits of the RWP were not established for that purpose. No plastic outer layer of PPE was specified as one might expect if removing radioactive liquids was planned. Upon entry into the excavated area around COB AW2, it was soon apparent that a leak had occurred and handling of significantly contaminated padding and liquid-containing bags was done because the FWS wanted to remove the hazard from the area. An RCT noted a smudge on a worker's outer PPE and upon surveying it, found that the level of contamination on the worker's clothing had exceeded the RWP void limit. The RCT immediately ordered the work to stop as the RWP was voided at this point.

The May 24, 2004, AN-01A Pump Removal resulting in radioactive contamination of two workers.

Removal of the AN-01A pump from the trailer to sawhorses for cut-up resulted in clothing contamination of two workers. Inadequate RWP requirements specified for the work is identified as a potential root cause in the event investigation team report. Work was conducted in an area not designated as a contaminated area (CA) and no PPE was required. Therefore, there was only one barrier (plastic bag) between the radiologically contaminated pump and workers. Work was not stopped when multiple holes were found in the pump bag during this job. Additionally, the RCT covering the job left the job site while lowering the pump onto the sawhorses was in progress. While the RCT was gone, work continued in the high radiation area (HRA) by continuing to lower the pump onto the sawhorses, although the RWP (PC-0093) required continuous RCT coverage.

The July 22, 2004, 244-CR Vault Thermocouple Removal Event resulting in an individual exceeding administrative radiation exposure limits for extremity dose

While pulling a thermocouple from the 244-CR Vault (CR-002 Tank) early on the July 22, 2004, graveyard shift, a Nuclear Chemical Operator (NCO) exceeded the extremity/skin Administrative Control Level (ACL) of 15 Rem. The operator received an extremity dose of

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22.057 Rem to the hands and a deep dose of 0.28 Rem. With approximately 30 feet of the thermocouple withdrawn (total length is approximately 36 feet) a rapid increase in the dose rate on the RO-20 was identified. The levels encountered exceeded the RWP limits. The instrument used by the RCT could not read the actual beta dose at the thermocouple due to the instrument being off-scale high on the highest range, indicating a level of > 50 Rad/hr at 30 cm. A decision to continue removing the thermocouple was made and the extremity/skin overexposure occurred as the worker applied the duct tape to the herculite bag surrounding the thermocouple.

The TFC has indicated that common elements to all of these incidents include unexpected radiological conditions, lack of upfront contingency planning, lack of preparation to implement effective contingency actions, failure to follow and live to RWP limits when unexpected conditions were encountered, continuing in the face of uncertainty as a default "safe condition," violation of procedures on numerous occasions, lack of root cause investigations (except for CR-Vault), and unwillingness to suspend work when encountering unexpected hazards.

In August 2004, ORP conducted an ISM focused review to provide assurance that the TFC and BNI ISM Programs are maintained and have improved subsequent to the most recent verification reviews. This review was conducted in response to the DOE Office of Environmental Management (EM) direction for each Operations Office to declare the status of their ISMS. Based on ORP oversight activities and assessment results, this review focused on the work scope definition and the feedback and improvement processes, particularly those associated with engineering issues. In addition, based on two recent events in the DOE complex resulting in the death of subcontractor workers, the review evaluated the processes and mechanisms for establishing safety programs and requirements associated with subcontractor work activities, along with the monitoring and enforcement of those requirements. The review resulted in the following overall conclusions about the status and effectiveness of the ORP/WTP/TFC ISMS:

- ISM elements are maintained and improvements were apparent.
- ORP has identified feedback and improvement issues associated with TFC operations. These issues indicate some weakness of ISM processes; but not broad programmatic breakdowns.
- Events and deficiencies indicate specific problems with ISM implementation; however, overall, the system is adequate and capable of ensuring safe performance of work.

Based on the results of the assessment, the team recommended that the ORP Manager establish a Tank Farm ISM Improvement Validation Team to validate the adequacy of the following associated with the events previously described:

- Investigation of each of the events,
- Determination of causes,
- Identification of corrective actions, and

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- Completion of corrective actions.

On September 8, 2004, the Defense Nuclear Facilities Safety Board (DNFSB) formally notified the DOE acting Assistant Secretary for Environmental Management (EM-1) of their concern that the "Integrated Safety Management (ISM) System for the Hanford tank farms is failing to control work activities adequately."

The ORP Manager informed the DNFSB that he concurred with their concerns and had communicated similar concerns to the TFC in multiple letters during the previous twelve months. Additionally, the ORP Manager reduced the TFC fee by \$300,000 in August 2004, because of the concerns. Although extensive DOE oversight is ongoing, the ORP Manager chartered a more comprehensive review, the Tank Farm ISM Improvement Validation. From October 18, 2004 to October 28, 2004, a review team conducted the pre-implementation portion of an ISM Improvement Validation of the TFC activities at the Hanford Site Tank Farms in the areas of Work Planning; Conduct of Operations; and Relevant Management Programs, including Feedback and Improvement. This review assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness. A post-implementation review, which will be conducted following corrective action implementation, will assess corrective action implementation effectiveness.

The review team was led by Frank McCoy of Washington Safety Management Solutions (WSMS) and consisted of Bill Lloyd of WSMS, Mark Brown of DOE-ORP, Susan Coleman of Innovations Corp. (DOE-ORP support contractor), Terry Krietz of DOE-EM, Joe Arango of DOE-EM, Gregg Doss representing Hanford Atomic Metals Trades Council (HAMTC), and John Longenecker of Longenecker and Associates. Team members were selected based on their significant relevant experience in ISM, nuclear safety and operation, safety health and quality programs, radiological control, project management, and work control. The team member's biographies are included in Appendix A.

The ISM Improvement Validation is being performed in two parts consisting of a pre-implementation review prior to full implementation of corrective actions and a post-implementation review after full implementation of corrective actions. The review documented in this report is the pre-implementation review. This pre-implementation review was conducted primarily through performance-based monitoring of work planning activities, program reviews, and personnel interviews. The review ascertained the causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness for the following incidents:

- the 244-CR vault incident;
- the six incidents (including the 244-CR incident delineated above) addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004;

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- the S-112 transfer incident; and
- other incidents specified by ORP.

A post-implementation review, which will be conducted following implementation of corrective actions, will ascertain their effectiveness.

The approach for this review consisted of the following elements with respect to the incidents specified above:

- Review of ORP, DNFSB, and the TFC correspondence, selected past and recent documented ISMS reviews, and the TFC compensatory measures document (TFC-MD-038, *Compensatory Controls for Radiological Control Performance*).
- Review of Occurrence Reports, Problem Evaluation Requests (PERs), and Price Anderson Amendments Act Nuclear Tracking System Reports.
- Review of documented Causal Analyses.
- Review of Corrective Action Plans.
- Interviews of project and program level personnel responsible for the causal analyses and corrective action determinations.
- Interviews of project and program level personnel responsible for compensatory measure determination and implementation, and corrective action implementation.
- Interviews with selected first line supervisors and groups of hourly workers.
- Observation of selected work planning meetings, ALARA reviews, Plan of the Day meetings, morning meetings, and pre-job briefings.
- Observation of selected compensatory measure implementation meetings.
- Observation of selected post-job briefings.

The review team observed three pre-job briefings, four work planning meetings, three work release/plan of the day meetings, an ALARA Joint Review Group (AJRG) meeting, and an intermediate post-job review. Over 125 personnel were interviewed, including 11 NCOs, 10 craft personnel, 20 first line supervisors, 26 technicians, 36 engineers and managers, and the President and Vice Presidents of the TFC. The team reviewed 48 documents, including procedures, PERs, occurrence reports, event investigation reports, non-compliance tracking system reports, management and independent assessment reports, external review reports, and various types of formal correspondence.

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3.0 OBJECTIVES, CRITERIA, AND RESULTS

DOE G 450.4-1B, *Integrated Safety Management System Guide for use with Safety Management System Policies (DOE P 450.4, DOE P 450.5, and DOE P 450.6); The Functions, Responsibilities, and Authorities Manual; and the DOE Acquisition Regulation* identifies continuing core expectations developed from the DOE policies, the requirements of the DEAR, and the fundamental attributes that support the implementation of ISM. These continuing core expectations were developed to provide a reference or starting point, which can serve as the basis for developing site- or facility-specific objectives and criteria in support of assessing an ISMS. Tailoring of the continuing core expectations for Hanford Site Tank Farms resulted in the objectives and criteria used during this review. The ISM objectives and criteria are provided in three major functional areas (1) Work Planning, (2) Conduct of Operations, (3) Relevant Management Programs, including Feedback and Improvement. The functional areas were then divided into pre-implementation review objectives and criteria, and post-implementation review objectives and criteria. The post-implementation review criteria will be expanded as necessary following completion of the pre-implementation review.

3.1 Work Planning

The Work Planning functional area includes all aspects of the Integrated Work Control Process implemented by the Hanford Site TFC. Included in the scope of this area are:

- Implementation of job hazards analyses,
- Implementation of radiological work permits,
- Incorporation of hazard controls into work packages and procedures,
- Work Planning and Scheduling,
- Pre-job briefings, and
- Work authorization process.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in work planning at the Hanford Site Tank Farms.

Pre-Implementation Objective: Determine if:

- Causal and common cause analysis and corrective action determinations for the above incidents are effective.
- Causal analyses appropriately identify ISM weakness and corrective actions are appropriate for resolution.
- Corrective action implementation for the above incidents is progressing satisfactorily.
- Current Work Control Compensatory Measures for the above incidents are adequate, implemented and effective.

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Post-Implementation Objective: Will determine if:

- Work Planning and Control corrective actions are substantially implemented.
- Work at Hanford Tank Farms is planned, authorized, and conducted in accordance with the process described in TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, for all activities.
- Hazards for each task are appropriately analyzed and controls implemented.
- Worker involvement is an integral part of the work planning and hazard analysis process.
- Management is closely involved in all aspects of the planning, analysis, authorization, performance, and lessons learned processes.

Pre-Implementation Criteria: The Team determined the extent to which:

- A. The Corrective Action Plan is supported by appropriate causal analyses.
- B. The Corrective Action Plan is supported by appropriate common cause analyses.
- C. The Corrective Action Plan has effective corrective actions.
- D. The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.
- E. The progress of corrective action implementation for Work Planning is adequate.
- F. The Compensatory measures for Work Planning are adequate, implemented and effective.
- G. Program reviews, observations, and interviews demonstrate that the implemented work control process is adequately described by TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*.
- H. Worker involvement in work planning is required and is observed to occur.
- I. Program reviews, observations, and interviews demonstrate that RWPs, Job Hazard Analyses (JHAs), and Industrial Hygiene (IH) Monitoring Plans are sufficient and appropriate for the work being performed.

Post Implementation Criteria: The Team will determine the extent to which:

- A. Work Planning and Control corrective actions are substantially implemented.
- B. Activity observations and interviews demonstrate that work planning is accomplished in accordance with the approved work planning and control procedures.
- C. Worker involvement in work planning is required and is observed to occur.

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- D. Program reviews, observations, and interviews demonstrate that RWPs, JHAs, and IH Monitoring Plans are sufficient and appropriate for the work being performed.
- E. Program reviews, observations, and interviews clearly show a rigorous and comprehensive process is required and implemented for the identification of hazards during the work planning process.
- F. Program reviews and observations show that an appropriate review and authorization process exists for controlling and coordinating the performance of work. Appropriate equipment control processes exist for assisting facility personnel in managing equipment/facility status during all phases of a work activity.
- G. Program reviews and observations demonstrate effective and appropriate hazard controls are implemented into work packages and procedures for the performance of work.
- H. Observations show that procedures, work packages, and other performance documents are written to an adequate level of detail such that workers can safely and efficiently perform each task in the order specified with minimal interpretation or clarification from other personnel.
- J. Observations demonstrate sufficiency of safety requirement specification into work packages and procedures.
- K. The Compensatory Measures for Work Planning are adequate, implemented and effective.
- I. Program reviews, observations, and interviews demonstrate that radiological work areas are surveyed, documented, and posted at specific frequencies, that routine radiation/contamination surveys are conducted in radiologically controlled areas, and that the results of radiological surveys are posted at the entrance to radiological work areas.
- J. Observations, and interviews demonstrate that areas established to control the spread of radioactive contamination (Radiological Buffer Areas, CAs, Fixed Contamination Areas, and Soil Contamination Areas) are barricaded and marked to prevent inadvertent entry.

3.2 Conduct of Operations

The Operations, Training, and Authorization Basis Implementation functional area consists of all aspects of Conduct of Operations, including associated implementation plans and applicability matrices. Included in the scope of this area are:

- Procedure compliance,
- Equipment and system status control,
- Review and authorization of work,
- Standing and shift orders,

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- Response to abnormal and emergency conditions, and
- Performance of work.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in Conduct of Operations at the Hanford Site Tank Farms.

Pre-Implementation Objective: Determine if:

- Causal and common cause analysis and corrective action determinations for the above incidents are effective.
- Causal analyses appropriately identify ISM weakness and corrective actions are appropriate for resolution.
- Corrective action implementation for the above incidents is progressing satisfactorily.
- Current Work Control Compensatory Measures for the above incidents are adequate, implemented and effective.

Post-Implementation Objective: Will determine if:

- Conduct of Operations corrective actions are substantially implemented.
- Competence is commensurate with responsibility for facility management and operations personnel.
- Processes to verify readiness at the facility level have been implemented in accordance with DOE order requirements, where applicable.
- Conduct of Operations is implemented in accordance with DOE Order requirements.

Pre-Implementation Criteria: The Team determined the extent to which:

- A. The Corrective Action Plan is supported by appropriate causal analyses.
- B. The Corrective Action Plan is supported by appropriate common cause analyses.
- C. The Corrective Action Plan has effective corrective actions.
- D. The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.
- E. The progress of corrective action implementation for Conduct of Operations is adequate.
- F. The Compensatory measures for Conduct of Operations are adequate, implemented and effective.

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- G. Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel demonstrate an understanding of the procedure compliance policy.
- H. Program reviews show that the conduct of operations program is consistent with the DOE approved Conduct of Operations Applicability Matrix.
- I. Observations show that the use of procedures, work packages, JHAs, RWP, IH Monitoring Plans, and other documents is appropriate and adequate for safe performance of work.
- J. Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.
- K. During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.

Post Implementation Criteria: The Team will determine the extent to which:

- A. Conduct of Operations corrective actions have been substantially implemented.
- B. The Compensatory measures for Conduct of Operations are adequate, implemented and effective.
- C. Program reviews, observations and interviews show that "readiness to proceed" is appropriately confirmed prior to start of new work activities.
- D. Observations demonstrate that operations personnel are responsible for the review, coordination, and approval of work activities prior to their start.
- E. Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel are observed to perform work in accordance with the procedure compliance policy.
- F. Program reviews, observations, and interviews demonstrate that operations personnel understand their roles and responsibilities during abnormal and emergency conditions.
- G. Program reviews show that the training program is consistent with the DOE approved Training Implementation Matrix.
- H. Observations show that the use of procedures, work packages, JHAs, RWP, IH Monitoring Plans, and other documents is appropriate and adequate for safe performance of work.
- I. Observations show that personnel performing work fully understand and comply with all aspects of the hazard controls within their work packages and procedures.

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- J. Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.
- K. During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.
- L. Observations and interviews reflect that during work performance personnel can be expected to utilize their Stop Work Authority, when required.

3.3 Relevant Management Programs Including Feedback and Improvement

The Management Programs functional area includes various site programs that represent Relevant Management Program (including Feedback and Improvement) components of ISM, as they relate to the scope of this review. Additionally, the Hanford Site Tank Farms ISMS program description is addressed in this functional area. Included in the scope of this area are:

- Management Assessment program,
- Independent Assessment program,
- Post-job briefings,
- Track and Trend Performance Indicators,
- Occurrence Reporting and Processing System (ORPS) and incident investigation,
- Corrective Action Plans, and
- Implementation of lessons learned and performance feedback.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in some management programs including feedback and improvement at the Hanford Site Tank Farms.

Pre-Implementation Objective: Determine if:

- Causal and common cause analysis and corrective action determinations for the above incidents are effective.
- Causal analyses appropriately identify ISM weakness and corrective actions are appropriate for resolution.
- Corrective action implementation for the above incidents is progressing satisfactorily.
- Current Work Control Compensatory Measures for the above incidents are adequate, implemented and effective.

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Post-Implementation Objective: Will determine if:

- Feedback and Improvement corrective actions are substantially implemented.
- The contractor's implemented Feedback and Improvement programs are consistent with and in accordance with the ISMS Manual.
- Contractor roles and responsibilities are clearly defined to ensure satisfactory safety, accountability, and authority.
- Line management is responsible for safety.
- Feedback information on the effectiveness of the ISM is gathered, opportunities for improvement are identified and implemented, and line and independent oversight is conducted.

Pre-Implementation Criteria: The Team determined the extent to which:

- A. The Corrective Action Plan is supported by appropriate causal analyses.
- B. The Corrective Action Plan is supported by appropriate common cause analyses.
- C. The Corrective Action Plan has effective corrective actions.
- D. The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.
- E. The progress of corrective action implementation for Feedback and Improvement is adequate.
- F. The Compensatory measures for Feedback and Improvement are adequate, implemented and effective.
- G. Program reviews show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.
- H. Program reviews interviews and observations demonstrate that line management is responsible for safety.
- I. Program reviews show that the occurrence reporting process as required by DOE is fully implemented.
- J. Program reviews show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.
- K. Program reviews and interviews show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. (Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.)

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Post Implementation Criteria: The Team will determine the extent to which:

- A. Feedback and Improvement corrective actions are substantially implemented.
- B. The compensatory measures for feedback and improvement are adequate, implemented and effective.
- C. Program reviews and observations show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.
- D. Program reviews and observations demonstrate that line management is responsible for safety.
- E. Observations demonstrate that personnel are competent commensurate with their responsibility.
- F. Program reviews and observations show that the occurrence reporting process as required by DOE is fully implemented.
- G. Program reviews and observations show that a process to develop Feedback and Improvement information opportunities at the site and facility levels, as well as, the individual work activity level is implemented.
- H. Program reviews and observations show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. (Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.)
- I. Program reviews and observations show that the organization and/or facilities perform trend analysis of performance indicators and safety and health data (including injury and illness, accident investigation, assessment and audit, and employee safety report experience) for identification and resolution of programmatic or systemic weakness.
- J. Program reviews and observations show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.
- K. Program reviews and observations demonstrate that a process is in place and is utilized by managers for considering and resolving recommendations for improvement, including worker suggestions.
- L. Program reviews and observations indicate that identified work package and procedure improvements and lessons learned are incorporated into the process. Post-job reviews are performed for specified activities.
- M. Program reviews and observations demonstrate that a formally structured, auditable facility program is in place to ensure that exposures are maintained ALARA.

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N. Observations demonstrate sufficiency of management and supervisory oversight of work performance.

3.4 Authorization Basis implementation during finalization of post-implementation criteria finalization.

Post implementation objectives and criteria to be established by February 2005.

3.5 Results

The results of this review are documented in Sections 4.0 through 7.0. An analysis of whether and how the results meet the criteria, whether the team concurs or non-concurs with the TFC associated corrective actions, and identification of Findings for additional action are provided in Section 8.0 and the team's conclusions are provided in Section 9.0.

4.0 ASSESSMENT OF IMPROVEMENT IN WORK PLANNING

4.1 Causal and Common Cause Analyses and Corrective Action Determination Effectiveness

The Causal Analysis Report, 244-CR Vault Thermocouple Removal; Extremity Administrative Control Level Exceeded, dated September 22, 2004, was reviewed to identify planned ISMS improvements, particularly in the area of work planning. The Root Cause Analysis (RCA) was a thorough evaluation of the event. The RCA accurately determined the causal factors associated with the event and included appropriate corrective actions. Since the RCA determined work planning weaknesses (hazard identification and control development) to be one of the root causes, corrective actions and improvements were provided for the area of work planning. These corrective actions were evaluated for their ability to prevent recurrence of the 244-CR Vault event and similar events; the corrective actions were determined to be adequate and, if effectively implemented, would prevent the aforementioned recurrences. Some deficiencies in the determination of corrective actions are noted in Section 6.7 of this report.

Additionally, the corrective actions in work planning were evaluated to determine their extent and capability at improving the TFC ISMS. The RCA corrective actions specifically focused on the ISMS core functions of defining the scope of work, hazard identification and developing controls to prevent or mitigate the hazards. These have the potential to be of significant value in improving the TFC ISMS. Examples of specific, planned ISMS program improvements noted in the area of work planning include:

- Develop a repeatable process for hazard identification that will ensure available data is obtained and data uncertainty is applied to support development of applicable hazard controls and contingency plans.
- Train and qualify appropriate personnel on the new hazard identification process.

This DOE ISMS Improvement Validation review also included a review of the *CH2M HILL Hanford Group Common Cause Analysis of Radiation Control Events*, dated September 30, 2004. This Common Cause Analysis (CCA), formally transmitted to DOE, was reviewed by the team to determine the effectiveness of the CCA at identifying improvements in the area of work planning. During this Improvement Validation review, the team determined that the CCA previously submitted to DOE was inadequate. As a result, the TFC immediately chartered a trained and experienced TFC team to perform a separate CCA, and report the results of this CCA to TFC management and DOE in November 2004. As a result, this report will not include a determination of the effectiveness of the CCA in evaluating the TFC work planning process. Additional information on the team's ISM Improvement Validation review of the September 2004 CCA can be found in Section 6.7 of this report.

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4.2 Appropriateness of Weaknesses in the Tank Farm ISM System Derived from the Causal Analyses and Addressed by the Corrective Actions and as Identified in this Review.

The 244-CR Vault event RCA was reviewed to determine the adequacy of the RCA in identifying weaknesses in the TFC ISMS in the area of work planning. The RCA was a thorough evaluation of the event. The RCA accurately determined the weaknesses in the TFC's work planning process, developed the causal factors, and included appropriate corrective actions to improve the TFC ISMS. Specific weaknesses identified in the RCA related to work planning included (summarized):

- Inadequate radiological hazard characterization.
- Inadequate training on a new requirement for single Enhanced Work Planning Sessions for each radiologically high risk work package.
- Shielding controls were not planned for or implemented as intended.
- Poor planning in developing dose rate monitoring methods.

The team considers this determination of ISM weaknesses in work planning to be appropriate.

The 244-CR Vault RCA did identify as a causal factor deficiencies in the implementation of the EWP process. This team also identified deficiencies in the TFC's implementation of the EWP process. Deficiencies were identified as a result of direct observation of a pre-job brief and interviews, and centered on inadequate worker involvement in the work planning process. Deficiencies included:

- Some workers who were interviewed stated that they were not involved in the work planning process.
- Some workers stated that, although they were involved in the work planning, including EWP sessions, their suggested changes to the work sequence/steps were ignored.

During the course of this review, the team observed a pre-job briefing, scheduled as a pre-work planning walk down of the work site by work group representatives. As a prelude to the pre-job brief, the FWS discussed the scope of the work packages (six) that were being planned and walked down. Both the planners and the FWS made statements during the meeting that indicated that worker input into certain portions of the jobs would not be considered due to schedule constraints and other reasons. This does not facilitate worker involvement in the planning process.

Team members also observed an AJRG meeting that was led by operations and attended by all relevant functional groups. There was active engagement and participation by the attendees.

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Interviews with work groups, managers, and workers also revealed an inherent value in having the same work team that plans the work also conduct the work. This type of approach to work planning and conduct has value as evidenced by interviews with specific groups that practice this approach, including the Fluor Federal Services construction group, and 222-S Laboratory staff. Benefits to retaining this "continuity" in the process can include improved coordination, safety, efficiency, morale, ownership, and participation in the planning process. Interviews with TFC senior management indicated that plans were being developed to implement a similar work planning and conduct process throughout the organization.

This DOE ISMS Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying weaknesses in the TFC ISMS, specifically in the area of work planning. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

4.3 Corrective Action Implementation Progress

The established corrective actions in work planning have progressed to the point that the TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, and TFC-OPS-MAINT-D-01.1, *Work Planning Guidance*, were issued on October 15, 2004 and became effective on October 25, 2004. These primary work controls procedures for tank farm operations incorporated the appropriate elements of TFC-MD-038, Revision D-5, *Compensatory Controls for Radiological Control Performance*. However, the team noted that the requirement to revise the ALARA Work Planning procedure (TFC-ESHQ-RP_RWP-C-03, issued July 21, 2004) to elevate the review and approval for determination of need and level of mock-ups to be performed for high risk radiological work to the Director level was not accomplished as scheduled. This procedure is currently in draft form, and based on the Significant PER, is now expected by November 30, 2004. This corrective action was originally due by October 15, 2004. Additional discussion on the progress of corrective action implementation is provided under the specific criteria in Sections 5.0 and 6.0.

4.4 Current Work Control Compensatory Measure Determination and Implementation Effectiveness

Implementation of the current work control compensatory measures contained in TFC-MD-038, Revision D-5, *Compensatory Controls for Radiological Control Performance*, has been effective in ensuring that radiological work is appropriately categorized as low, medium, or high. In addition, contingency plans are included in the technical work documents as part of the planning process. Observation of an AJRG meeting indicated that appropriate aspects of the work, RWP and safety condition controls, lessons learned, and other topics were reviewed. Pre-job briefings addressed and emphasized the MD-038 compensatory measures.

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4.5 Adequacy with Which the Work Planning and Control Manual Describes the Implemented Program

The revised TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, and TFC-OPS-MAINT-D-01.1, *Work Planning Guidance*, was recently approved and became effective during this review. Interviews with the planning manager, a planning lead, planners, and various craft personnel, in conjunction with observation of planning meetings indicates that there is a basic understanding of the revised process, but full implementation will still require a strong emphasis on training and mentoring. Assessment of the implementation of the new work planning and control procedures will be a major focus of the March 2005 review.

4.6 Effectiveness of Worker Involvement in Work Planning

Interviews of FWSs, operators, planners, and observation of planning meetings and pre-job briefings indicate there is mixed success in ensuring effective worker involvement in work planning. In two pre-job briefs that were observed, employees were alert, provided good comments about the work and safety controls, and asked appropriate questions regarding equipment use, contingency plans, and other aspects of the job to ensure there was a clear understanding of the work and controls. In one observed planning meeting workers and appropriate craft were involved and active in the discussion on step-by-step procedures. Their input allowed for changes to the work package to provide an improved workspace.

However, interviews with planners, supervisors and workers, indicated several concerns for implementing some of the worker involvement enhancements. There was a concern regarding the expectation for involving the workers who will be performing the work, will be the ones engaged in the planning progress, including the team planning meeting (similar to an EWP meeting). The concern centers on the logistics for ensuring the continuity of workers throughout the work planning through execution of the work, given that there can be up to a two-month period before work is executed. Through worker interviews, it was noted that there is a perception among the workers that their input to the work package and safety controls are not always included in the final work package. The FWS on the other hand, appeared frustrated that workers performing the work were not the workers involved in the planning, and that as a result they expressed differing views or work preferences as the work started. The RCTs interviewed believed that they are not being adequately involved in RWP development.

Based on interviews, first line supervisors are effectively engaged in work planning, however, worker involvement appears to be less than effective. The TFC should examine those Hanford examples cited as effective in Sections 4.2 and 7.0, as well as, changes recently implemented at CH2M HILL-affiliate sites to better understand how to improve in this area. (FINDING)

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4.7 Effectiveness of RWPs, JHAs, and IH Monitoring Plans

Several work packages and their associated RWPs, JHAs, and IH monitoring plans were reviewed. The job specific RWPs now being developed were found to be comprehensive and address action, safe condition and void limits. However, interviews with the RCTs indicated they have not embraced the job-specific RWP system. The RCTs believe that there is additional training necessary to fully comprehend the RWP directions, and believe the RCTs need to be involved more directly in RWP development.

The status of the IH monitoring plans is improving with an overall IH monitoring strategy for the Tank Farms. With the conservative protection posture relating to non-radiological airborne contaminants and respirator protection in the Tank Farms, the current IH monitoring plans are adequate until the overall IH tank farm corrective actions are in place and decisions are made to provide different IH controls based on the new characterization data for potential exposures.

The expectations for how JHAs are prepared are included in revised TFC procedures, and interviews with planners indicate a basic understanding of the new JHA expectations. A review of a number of JHAs currently going through the planning process indicates that they have not yet met the expectations for a job specific and step-by-step analysis of the hazards associated with each step and the specific control needed at that point in the work. **(FINDING)** Several older standing JHAs were pieced together to have a "composite" JHA, but still remained high-level, general, and simply reflected a laundry list of hazards that may be associated with the work, e.g., fall hazards, excavating, overhead, or electrical. Additional training, mentoring and use of examples or standard formats could help in the implementation of job specific (step-by-step) JHAs. However, the team noted that the work instructions themselves are now showing more detail in work steps and specific hazard controls.

5.0 ASSESSMENT OF IMPROVEMENT IN CONDUCT OF OPERATIONS

5.1 Causal and Common Cause Analyses and Corrective Action Determination Effectiveness

The 244-CR Vault event RCA was reviewed to identify planned ISMS improvements, particularly in the area of Conduct of Operations. The RCA was determined to be a thorough evaluation of the event. The RCA accurately determined the causal factors associated with the event and included appropriate corrective actions. Since the RCA determined Conduct of Operations weaknesses to be one of the contributing causes, the RCA did identify corrective actions and improvements in the area of Conduct of Operations. These corrective actions were evaluated for their ability to prevent recurrence of the 244-CR Vault event and similar events; the corrective actions were determined to be adequate and, if effectively implemented, would prevent the aforementioned recurrences. Some deficiencies are noted in Section 6.0 and 7.0 of this report.

Additionally, the corrective actions in Conduct of Operations were evaluated to determine their extent and capability at improving the TFC ISMS. The RCA corrective actions specifically focused on the ISMS core functions of performing work within the defined scope and controls, and in ensuring an effective feedback and improvement process. The corrective actions have the potential to be of significant value in improving the TFC ISMS. Examples of specific, planned ISMS program improvements noted in the area of Conduct of Operations include:

- Develop classroom training on Conduct of Operations (to be provided as part of continuing training).
- Update qualification requirements for some workers to include demonstration of conduct of operations.
- Implement an Operations Table Top drill program.
- Obtain available technology for improved communication devices for use with respirators.
- Revise pre-job briefing procedure to address command and control and communications.

This ISM Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying improvements in the area of Conduct of Operations. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

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5.2 Appropriateness of Weaknesses in the Tank Farm ISM System as Derived from the Causal Analyses and Addressed by the Corrective Actions and as Identified in this Review

The 244-CR Vault event RCA was reviewed to determine the adequacy of the RCA in identifying weaknesses in the TFC ISMS in the area of Conduct of Operations. The RCA was determined to be a thorough evaluation of the event. The RCA accurately determined the weaknesses in the TFC's Conduct of Operations, developed the causal factors, and included appropriate corrective actions to improve the TFC ISMS. Specific weaknesses identified in the RCA related to Conduct of Operations included (summarized):

- Shared command and control structure led to an inappropriate decision.
- Communications in the field were less than adequate.
- Response to over-ranged dose rate monitoring equipment and exceeding void limits was inadequate.
- Management has not ensured implementation of Conduct of Operations in field work activities.

The team considers this identification of ISM weaknesses to be appropriate.

This DOE ISMS Improvement Validation review also included a review of the CCA, to determine the effectiveness of the CCA at identifying weaknesses in the TFC ISMS, specifically in the area of Conduct of Operations. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

5.3 Corrective Action Implementation Progress

Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated September 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the status of the action items, and determined that four of the six are complete. The remaining two actions are overdue, based on the corrective action plan. There are 28 additional corrective actions due by February 2005. Further, the common cause analysis may add additional corrective actions that must be closed by February 2005.

There are 11 corrective actions directly related to Conduct of Operations with the root cause that management has not ensured that Conduct of Operations attributes applicable to field work activities have been fully implemented. One of these actions was to revise the ALARA Work Planning procedure to elevate the review and approval for determination of the need for mock-ups for high risk radiological work to the Director level (due October 15, 2004). This action is not yet complete. A revision to the ALARA Work planning procedure, TFC-ESHQ-RP-RWP-C-03, was drafted, but not yet issued. The team reviewed the draft procedure and confirmed that

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the corrective action was incorporated into the draft. Another one of the 11 corrective actions was to develop classroom training on Conduct of Operations (due October 28, 2004). The initial classroom training was prepared and presented in a pilot session on October 26, 2004; however, the training materials were determined to be inadequate. Formal training was to be initially presented on October 28 and 29, 2004, but the training was delayed in order to address the weaknesses identified in the training materials.

The team considers that progress of corrective action implementation for Conduct of Operations may not be adequate. It is not apparent that progress to date will support the TFC February 2005 mid-point assessment and/or the March 2005 ISM Improvement Validation assessment.

5.4 Current Conduct of Operations Compensatory Measure Determination and Implementation Effectiveness

The compensatory measures in MD-038 are narrowly focused to immediately change the behavior of the affected crews. The compensatory measures significantly reduce the discretion of the field level manager/FWS in the execution of field activities. These compensatory measures are warranted at this time. The TFC may wish to modify these actions when performance meets and or exceeds expectations.

The compensatory measures in MD-038 are well understood by the field crews. The field crews stated that they would "stop and pull out, place personnel in a safe condition" at the first indication of a changing condition, change in scope or any other anomaly that was not included as a contingency in the work package.

Acceptance of the MD-038 requirements has not been fully realized. The crews consist of many highly experienced personnel. These personnel have a wealth of knowledge that includes a full set of workarounds that have been used for many years. Management must continuously reinforce MD-038 expectations to ensure enduring improvement. Management must not communicate any mixed messages.

The policy in MD-038 for the use of the Senior Supervisory Watch (SSW) is adequate. Based on interviews, each SSW understands his roles, responsibilities and authority. The current approved list of SSWs is limited. The requirements of MD-038 were embraced by each SSW. MD-038 requires every medium and high risk evolution to include the SSW as a part of the evolution. This construct will work in the near-term, but operations will need to add additional personnel to the list as work tempo increases.

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5.5 Current Conduct of Operations Compensatory Measure Determination and Implementation Effectiveness

Based on interviews with tank farm personnel, policy with respect to procedure usage and compliance is well understood. This is a direct result of the implementation of MD-038. TFC personnel stated that "procedures must be followed as written." This was echoed by the first line managers and FWSs.

5.6 Consistency of the Conduct of Operations Program with the Approved Conduct of Operations Applicability Matrix

The team determined that the Conduct of Operations program is consistent with the ORP-approved Conduct of Operations Applicability Matrix. The Conduct of Operations Matrix is included as Attachment A in the *Conduct of Operations Implementation Plan*, TFC-PLN-05, Revision B-8, which was most recently updated and approved on March 17, 2004. The Plan clearly states that changes to the Conduct of Operations Matrix require DOE approval and that the matrix is being maintained current on at least an annual basis, as required. The Matrix specifies the TFC's implementing policy documents and procedures, as well as, specifying the scope of applicability and any deviations for the chapters in DOE Order 5480.19, *Conduct of Operations*.

Observations of the implementation of conduct of operations was limited in this review to mostly work planning sessions, pre-evolution briefs, and a post-work review between an FWS and the work crew. Based upon those limited observations, the team determined the Conduct of Operations Matrix was implemented for the pertinent elements related to those evolutions observed. The team expects to focus the second part of its review effort, scheduled for March 2005, on actual field implementation. This will provide a broader basis for determination of the effectiveness of the actual field implementation of the Conduct of Operations program.

5.7 Effectiveness of the Use of Procedures, Work Packages, JHAs, RWP, IH Monitoring Plans and Other Documents during Work Performance

Based on interviews, it is clear that personnel intend to follow the technical work documents. If the technical work documents cannot be followed as written, work will stop and revisions will be made. This area will be fully assessed in March 2005.

5.8 Ability to Recognize Changing and/or Unknown Conditions and Appropriately Suspend Work Activities Until They are Appropriately Dealt With

Based on interviews with planners, managers, senior supervisor watch managers, workers, and observations of several work planning sessions, it was observed that TFC understood the expectations of TFC-MD-038 to plan for changing and unknown conditions. The ability to recognize these types of conditions during planning was evident.

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The field crews stated that they would “stop and pull out, place personnel in a safe condition” at the first indication of a changing condition, change in scope or any other anomaly that was not included as a contingency in the work package. Full understanding of whether or not the planning process is identifying and accounting for all relevant contingencies, and the work forces response to actual condition will occur during the March 2005 assessment.

5.9 Ability to Appropriately Suspend Work and Modify Work Documents When Work Documents Cannot be Performed as Written

No field work was assessed during this phase of the review. Based on interviews, it is clear that personnel intend to follow the technical work documents. The work control procedures for the Tank Farms provides for steps to take when conditions have changed or work cannot be performed as provided for in the work package. The steps appear to be workable for minor steps, but there does appear to be a concern over the ability to quickly resolve “stop work” issues and continue the work. The field crews stated that they would “stop and pull out, place personnel in a safe condition” at the first indication of a changing condition, change in scope or any other anomaly that was not included as a contingency in the work package. This area will be fully assessed in the March 2005 assessment.

6.0 ASSESSMENT OF IMPROVEMENT IN MANAGEMENT PROGRAMS, INCLUDING FEEDBACK AND IMPROVEMENT

6.1 Causal and Common Cause Analyses and Corrective Action Determination Effectiveness

The 244-CR Vault event RCA was reviewed to identify planned ISMS improvements, particularly in the area of Management Programs, including Feedback and Improvement. The RCA was a thorough evaluation of the event. The RCA accurately determined the causal factors associated with the event and included appropriate corrective actions. Since the RCA determined weakness in feedback and improvement to be a contributing cause, the RCA also identified corrective actions and improvements in the area of feedback and improvement. These corrective actions were evaluated for their ability to prevent recurrence of the 244-CR Vault event and similar events; the corrective actions were determined to be adequate and, if effectively implemented, would prevent the aforementioned recurrences.

Additionally, the corrective actions in Management Programs, including Feedback and Improvement were evaluated to determine their extent and capability at improving the TFC ISMS. The RCA corrective actions focused on the ISMS core function of effective feedback and continuous improvement have the potential to be of significant value in improving the TFC ISMS. Examples of specific, planned ISMS program improvements noted in the area of feedback and continuous improvement include:

- Develop process for improving the use of lessons learned in work planning.
- Train appropriate personnel in the use of the lessons learned work planning database.
- Modify ALARA management processes to incorporate applicable lessons learned in the radiological planning process.

This DOE ISMS Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying improvements in the area of Conduct of Operations. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

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6.2 Appropriateness of Weaknesses in the Tank Farm ISM System as Derived from the Causal Analyses and Addressed by the Corrective Actions and as Identified in this Review

The 244-CR Vault event RCA was reviewed to determine the adequacy of the RCA in identifying weaknesses in the TFC ISMS in the area of management programs, including feedback and improvement. The RCA was a thorough evaluation of the event. The RCA accurately determined weaknesses in some management programs, including feedback and improvement, developed the causal factors, and included appropriate corrective actions to improve the TFC ISMS. Specific weaknesses identified in the RCA related to management programs, including feedback and improvement, included (summarized):

- Past lessons learned from work activities with high energy beta radiation were not adequately applied.
- Management has not adequately defined what constitutes "placing the plant in a safe condition."
- Management has not ensured implementation of Conduct of Operations in field work activities.

The Team considers this identification of ISM weaknesses to be appropriate.

This DOE ISMS Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying weaknesses in the TFC ISMS, specifically in the area of management programs. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

6.3 Corrective Action Implementation Progress

Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated September 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the status of the action items and determined that four of the six are complete. The remaining two actions are overdue, based on the corrective action plan. There are 28 additional corrective actions due by February 2005. Further, the common cause analysis may add additional corrective actions that must be closed by February 2005.

One of the overdue actions was to procure and develop a process for use of electronic personal dosimetry with both beta and gamma measurement capabilities (due September 27, 2004). Some equipment had been procured by the due date and was tested in the field in late October, but the process for use has not yet been developed. The second overdue action was to revise the ALARA Work Planning procedure to elevate the review and approval for determination of the need for mock-ups for high risk radiological work to the Director level (due October 15

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2004). A revision to the ALARA Work Planning procedure, TFC-ESHQ-RP_RWP-C-03, was drafted but not yet issued. The team reviewed the draft procedure and confirmed that the corrective action was incorporated into the draft.

The team considers that progress of corrective action implementation for Feedback and Improvement may not be fully adequate. It is not apparent that progress to date, will support the TFC February mid-point assessment and/or the March 2005 assessment.

6.4 Current Feedback and Improvement Compensatory Measure Determination and Implementation Effectiveness

The compensatory measures in MD-038 are adequate. It requires the workers be involved in the planning process and included in the feedback process. The use of roundtable planning sessions, enhanced work planning sessions, intermediate post job reviews and post job reviews are evident.

The team interviewed field crews, construction crews and their supervisors, as well as, the SSWs and Radiological Control Area managers. These crews were from Waste Feed Operations and Closure Projects. The interviews included questions specific to expectations in the area of ISMS. The interviewees identified that the overwhelming weakness in the ISMS program is Feedback and Improvement.

The workers indicated that they have provided input into the work package development process. The workers stated that although their input is provided, the finished package does not consistently reflect their input. Some workers indicated that their input is largely unused and sometimes ignored.

It is clear to the team that all input is not required to be included into the work documents, as there are many ways to complete a given task. The weakness may be that management is not clearly communicating the outcome to the workers. If this situation continues the workers may remove themselves from the process.

6.5 Effectiveness of Clear Definition of Roles and Responsibilities for Safe Performance of Work

The TFC has an ISMS Description and other management procedure documentation that outlines roles and responsibility for safe performance of work. There have been a number of organizational changes over the last six months. In fact, a reorganization was in progress during the team's on-site visit. Many of these changes are to align support organizations, such as, radiation control, industrial safety, IH, and planning staff as a direct part of the operations line management. Central organizations to provide direction, guidance and interpretation services for the support groups now in the line are currently being staffed. While most managers and workers believed that their specific safety-related responsibilities did not change and could be effective under operations line management control, several RCTs believed working directly under operations line management may compromise their ability to ensure radiological safety requirements due to the potential for pressure to continue work.

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The team believes the TFC has partially met the criteria due to the need to verify all the recent and pending organizational changes are properly documented, implemented and all central program staffs are in place. In addition, the TFC should clarify how technical support personnel interact with the central program staffs to resolve technical issues effecting safety of the work.

The roles and responsibilities outlined in MD-038 are clear. These responsibilities are well understood and embraced by first line supervisors. The acceptance of these new requirements appears to be lacking at the worker level. The workers understand that these are requirements and that they must comply with them, but they have also stated that they believe the represent an overreaction to the situation. Management must ensure that they continue to communicate the necessity and value of this change to the workforce.

6.6 Effectiveness of Line Management Responsibility for Safety

In assessing the interview results summarized in Section 7.0, the Team considers that managers, above the first line supervisory level, are rarely seen at the worksite by the workforce. Consequently, they are unable to manage the perceptions of the work force and are unable to function as effective change agents. In this regard, the Team believes that managers at all levels should spend significantly more time with the work force observing planning and actual performance of work with the goal to understand and remove barriers to safe and effective work performance and to coach and mentor specific management expectations. The Team also believes that management expectations regarding major issues, their significance, and required changes were not consistently being communicated with a single, simple, unified message of "what needs to change and why." Such a message should emanate from the TFC President through the line managers and supervisors to the workforce.
(FINDING)

6.7 Effectiveness of Occurrence Reporting, Issues Management, Lessons Learned Program, and Conduct of Critiques and Investigations

Root Cause Analysis for the 244-CR Vault Overexposure Event

The team reviewed the *Causal Analysis Report, 244-CR Vault Thermocouple Removal; Extremity Administrative Control Level Exceeded*, dated September 22, 2004, to determine the following:

- Was the analysis effective at determining the appropriate causal factors for the event?
- Were the root causes correctly identified—If the root causes were corrected, would this prevent recurrence of this and similar events?
- Verify that the identified corrective actions address the causes.
- Determine if the corrective actions will prevent recurrence of the identified causes.

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- Determine if the immediate actions taken were appropriate, effective, and ensure safe operations pending completion of the causal analysis corrective actions.

The TFC chartered a RCA team for the CR Vault event approximately two days after the event. The team was made up of trained, knowledgeable, experienced causal analysis evaluators. The ISM Improvement Validation team evaluated the RCA and found it to have been adequately performed, identifying appropriate causal factors and meaningful corrective actions.

One of the first actions taken by the RCA team was to conduct separate interviews of all personnel involved in the event, including work planners and other support personnel. This action was critical to gather relevant facts, since the critique of the event, which occurred a day after the event, was determined by the RCA team to have been inadequate in gathering relevant facts and developing an accurate timeline of the event.

Once the RCA team gathered all relevant facts, the team worked to determine the causal factors and corrective actions. Classical causal analysis techniques were employed to evaluate the event, including Barrier Analysis and Event and Causal Factor Charting.

The DOE ISMS team developed the following conclusions regarding the RCA:

- **Was the analysis effective at determining the appropriate causal factors for the event?**

Based on interviews and a detailed review of the event, the appropriate causal factors were identified in the RCA. The analysis was consistent with DOE-NE-STD-1004-92, *Root Cause Analysis Guidance Document*, in conducting root cause analysis.

- **Were the root causes correctly identified—If the root causes were corrected, would this prevent recurrence of this and similar events?**

The RCA correctly identified 3 root causes for the event. Root cause analysis techniques were properly employed by the RCA team to determine the root causes for the event. Based on analysis of the root causes identified, correcting the causes will prevent recurrence of this and similar events.

- **Verify that the identified corrective actions address the causes.**

All corrective actions identified by the RCA team were reviewed to ensure that they adequately addressed the causes identified in the report. The RCA team identified 34 corrective actions. Some deficiencies were identified with the corrective actions for five of the causes detailed in the RCA. **(FINDING)** The following discussion provides specific details of the deficiencies:

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- RC02: *Management has not ensured that Conduct of Operations attributes applicable to field work activities have been fully implemented*—the corrective actions for this root cause do not include a requirement for management to reinforce Conduct of Operations expectations in the field through direct observation and reinforcement. This is critical to ensure that the corrective actions associated with training, qualification, use of mock-ups, and drills are effective in improving Conduct of Operations in the field.
- RC03: *Management has not established the correct standard and process for what constitutes “placing the plant in a safe condition”*—the corrective actions for this root cause do not include a requirement for management to reinforce expectations for placing the plant in a safe condition through direct observation and reinforcement. This is critical to ensure that the new requirements implemented in MD-038 and other procedures are understood and adequately implemented in the field.
- CC01: *Past lessons learned from LLCE removal activities for use of beta shielding materials (lead gloves/rubber matting) and remote handling techniques were not adequately applied*—the corrective actions for this contributing cause were not specific enough to adequately focus efforts to minimize or prohibit direct contact handling of Long Length Contaminated Equipment (LLCE) and similar tank waste contacted equipment that have the potential to emit significant amounts of radiation and can (and have) result in excessive exposure to the workers.
- CC02: *The engineering controls to utilize spray washers to reduce dose rates was not verified to be operating correctly*—The corrective action to “Incorporate requirements for engineering control verification of operability into the work planning checklist” is inadequate in preventing recurrence of the problem. Specifically, it was determined in the RCA that the spray ring assembly was not verified to be properly operating during the work activity. Procedure TFC-ESHQ-RP-RWP-C-03, *ALARA Work Planning*, requires that the Support Health Physicist will “Verify engineered barriers for minimizing contamination of equipment will perform, or have performed their intended function before relying on the barrier.” This requirement is sufficiently vague to permit the pre-use verification without subsequent in-use verification.
- CC05: *The failure of the RCT to adequately ensure that the operators and the FWS understood the actual levels encountered and the failure to understand what the RWP void limits were contributed to the lack of knowledge and subsequent lack of urgency during the remaining field work activities which added to the amount of*

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exposure received—No corrective actions were listed for this contributing cause other than “progressive performance management.” However, some corrective actions are appropriate for this contributing cause. The DOE ISM Improvement Validation team noted that the TFC has taken corrective measures for this cause and should include this information in the report (e.g., including RWP action levels in the work steps, management’s expectation that the FWS not rely on the RCT to ensure compliance with the RWP, corrective actions associated with communications, command and control, and conduct of operations, etc.).

- **Determine if the corrective actions will prevent recurrence of the identified causes**

The team reviewed the corrective actions detailed in the RCA. Although some deficiencies were identified with the corrective action plan (previously identified in this section of the report), the team determined that the corrective actions, if effectively completed, could prevent recurrence of the CR Vault event and similar events. As previously stated, the corrective action plan did not include regular management involvement in the implementation of the corrective measures. Although midpoint and endpoint assessments are planned, continuous management involvement throughout the implementation phase is critical to observe field implementation of the corrective actions, and to reinforce expectations.

- **Determine if the immediate actions taken were appropriate, effective, and ensure safe operations pending completion of the causal analysis corrective actions.**

The immediate actions taken following the 244-CR Vault event, along with the compensatory measures developed and promulgated in management directive, MD-038, were determined to be appropriate and effective in ensuring safe operations, pending completion of the RCA corrective actions. The actions taken by the TFC were appropriately conservative, ensuring protection of the workforce.

Common Cause Analysis of Radiation Control Events

This DOE ISM Improvement Validation review also included a review of the *CH2M HILL Hanford Group Common Cause Analysis of Radiation Control Events*, dated September 30, 2004. The team reviewed the CCA to determine the effectiveness of the CCA at identifying commonalities in several events that have occurred over the past 15 months, in developing causes for the recurrence of the events, and in developing a corrective action plan to address the identified common causes to prevent their recurrence. This CCA was performed by a subcontractor to the TFC (Performance Improvement International, PII), and included two TFC team members.

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The PII report that was transmitted to DOE as a CCA did not systematically identify which causes were substantially common to a majority of those events, and did not identify the analytical basis for conclusions reached other than through employee interviews. **(FINDING)** Rather, the report's conclusions were supported by quotes from employee interviews that may or may not accurately reflect the facts related to the seven identified radiological events. Since the PII report is not considered a CAA, the TFC should take appropriate action to correct the record with DOE. **(FINDING)** The following specific actions are expected:

- Correct the record (TFC letter to DOE forwarding the PII report) to specifically state what the PII report represents.
- Prompt completion of the planned, more rigorous CCA, and transmit it to DOE.

The CCA identified the common cause of the failures of the radiological events as:

- a. Ineffective management control of performance,
- b. Management actions to prioritize production outcomes above safety and quality, and
- c. Lack of emphasis on "changing the people" as a part of a strategic change management effort.

This characterization does not relate directly to the ISMS elements at issue including improper work planning and hazard identification, work done outside the established work package controls, and a breakdown in the feedback and improvement process.

Another deficiency in the PII analysis was that it did not identify as a common cause, communication problems/failures between the RCTs and the work crews that contributed to the events.

During this DOE ISM Improvement Validation review, both the DOE team and the TFC determined that the PII report, previously submitted to DOE, was inadequate. As a result, the TFC immediately chartered a trained and experienced TFC team to perform a separate, more rigorous CCA and report the results of this CCA to TFC management and DOE in November 2004. DOE will review the CCA once it is completed and submitted by the TFC. However, the TFC should correct the record on what the PII report represents relative to an effective common cause analysis. This team will also review the TFC CCA when it is completed, and issue a supplement to this report.

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The team conducted a general review of the PERs, occurrence reports, and event investigation team reports and causal analyses of the six radiological events identified in the DOE letter from R.J. Schepens, ORP Manager, to E. S. Aromi, TFC President, dated August 24, 2004. The team noted that an adequate causal analysis was not conducted for all of the events. Therefore, it would be prudent for the TFC to ensure that the causal factors are adequately identified for each event when conducting the common cause analysis.

Occurrence Reporting Process

The DOE occurrence reporting process was determined to be implemented as evidenced by interviews with DOE and TFC personnel, and document reviews. One previously identified deficiency exists regarding the DOE M 231.1-2 requirement for the TFC to conduct periodic performance analyses of events to identify trends and to report the results of these analyses to DOE. During this review, the TFC was conducting the first of these analyses and, in parallel, developing procedures to implement this DOE Manual requirement. Reviews of several occurrence reports, the most recent TFC management assessment of occurrence reporting, and interviews with the DOE-ORP occurrence reporting program manager revealed no other deficiencies.

Issues Management Program

Interviews and our review of PER system reports indicated a negative trend in the average time to closure for ESTARS actions associated with PERs. The cycle time for PER closure has increased from 91 days in March 2004 to 120 days in September 2004. The TFC indicated that this trend could be due to several factors including:

- High number of PERS that were entered into the system during this time (more than 1000 per month) likely due to the number of assessments performed on the TFC during this period,
- Change in criteria for dealing with PERs relating to illnesses and injuries,
- High number of PERs resulting from a 2004 review of drawing discrepancies in the field.
- Deferral of Track Until Fix (TUF) items, such as, housekeeping and minor maintenance items during the period in which work must be performed on supplied air.

The March 2005 ISM Improvement Validation review will evaluate whether the cycle time for PER closure has improved, as well as, whether corrective actions have been implemented to prevent recurrence of problems in the field.

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Lessons Learned

From the interviews, the team concluded that Feedback and Improvement mechanisms need to be improved to assure that lessons learned are provided to those who plan and conduct the work in a manner that is timely, concise and user friendly. Specifically, work planners need prompt and easy access to lessons learned for similar jobs.

Interviews indicated that some find it very work intensive and time consuming to get lessons learned data out of the system. However, the resource page on the web site is a positive improvement that is now starting to be used by work planners. The overarching goal should be to provide lessons learned for similar jobs to those planning and conducting the work without the necessity for them to sort through the entirety of the lessons learned that populate the database.

A January 2004 TFC assessment of the lessons learned program also concluded that no formal process exists for incorporating lessons learned into future training courses. This assessment also noted that performance metrics for the lessons learned program are not generated monthly as committed to in past corrective actions.

During the March 2005 review, the team will assess the lessons learned program, evaluating the effectiveness of the program in enabling timely changes to work processes based on lessons learned.

Critiques and Investigations

The TFC process for the conduct of critiques and investigations was reviewed and revealed no deficiencies. Interviews and document reviews revealed that critiques and investigations are appropriately conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. Critique and investigation reports reviewed were determined to be adequate.

During the course of review of the 244-CR Vault Root Cause Analysis, the team determined that the critique performed following the event was inadequate. Interviews with personnel present at the critique identified the following specific deficiencies:

- An excessive number of personnel attended the critique (estimated to be 60).
- An accurate timeline was not developed.
- One individual dominated the discussion (an FWS).
- Personal statements were not obtained prior to the critique.
- The critique leader did not drive the gathering of relevant facts.
- The critique was too narrowly focused on one part of the entire event.
- Senior managers present at the critique did not enforce their expectations for critique conduct.

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A review of the PER database, and interviews with the RCA team indicate that the inadequacies identified in the critique of the CR Vault event were not formally identified, nor were corrective actions taken as a result of the inadequate critique.

(FINDING) Discussions with DOE Facility Representatives indicate that inadequate critiques, such as the CR Vault critique, are a recurring issue.

Other Management Programs (Competence commensurate with responsibility)

The team observed that many supervisors and hourly workers appeared to be weak in the practical application of radiological controls associated with ionizing radiation. Additionally, hourly workers appeared to lack some fundamentals knowledge regarding ionizing radiation hazards and limitations. In this regard radiation hazards were not considered by many supervisors or hourly workers to be dominant hazards. In addition, work practices such as hand contact of high beta – gamma dose materials reinforced the need to improve in this area. Additionally, some first line supervisors were unable to clearly articulate Conduct of Operations and ISMS attributes. **(FINDING)**

7.0 WORK CREW AND FIRST LINE SUPERVISOR INTERVIEW ASSESSMENT

Team members interviewed over 125 TFC personnel. These personnel included bargaining unit workers, first line managers, and managers throughout the line organization. A set of lines of inquiry was developed to provide some consistency in each of the interviews and to assure that questioning addressed such things as recent incidents, compensatory measures and corrective actions, worker involvement in planning, stop work authority, and salient elements of conduct of operations. Interviews were in a closed-door office setting. Some interviews were conducted in a group setting, while others were individual interviews. This assessment focused on interviewee input that the Team considered was relevant to this validation effort, represented the norm of interviewees rather than isolated extremes, and was considered by consensus to represent a correct and valid statement of the input. Interviewee input meeting the above criteria is delineated below.

- Supervisors and hourly workers were found to be generally smart, willing to change, and concerned about future job security.
- Supervisors appeared to be “results oriented” with a self-motivated desire to get work done. In this regard they expressed some frustration with delays in work planning and package development due to resource limitations, excessive PPE for situations that they do not believe pose real hazards, and maintaining stop work conditions for excessive periods of time to fully resolve some raised issues when there is believed to be no imminent hazard. Some hourly workers shared similar frustrations.
- In some cases, hourly workers indicated that their input into work planning was not reflected in the final work plan and was sometimes ignored. Also, review of correspondence between hourly workers and middle managers indicated real or perceived conduct of operations, management, and safety issues that were not believed to be properly attended to by first line supervisors and other middle managers.
- Supervisors and hourly workers demonstrated understanding of MD-038 compensatory measures. One exception is that they did not appear to recognize that stopping work can be of short duration and resolution can be real time. The hourly workers perceived the MD-038 solution to be overly reactive and too prescriptive to enable effective work performance. The Team considers that achievement of full buy-in and recognition that these new measures can enable rather than hinder work performance will require continued mentoring as well as gaining experience with the new packages and action levels during continuing work performance.

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- Supervisors and hourly workers appeared to be weak in the practical application of radiological controls associated with ionizing radiation. Additionally, hourly workers appeared to lack some fundamentals knowledge regarding ionizing radiation hazards and limitations. In this regard radiation hazards were not considered by many supervisors or hourly workers to be dominant hazards and hand contact with high dose materials was considered acceptable.
- Supervisors demonstrated an understanding of the fundamentals of Conduct of Operations; however some could not clearly articulate attributes of ISM or Conduct of Operations. Hourly workers demonstrated an understanding of those Conduct of Operations fundamentals embodied within MD-038, but not those outside of MD-038.
- Supervisors and hourly workers indicated they rarely saw management above the first line supervisor in the field observing work. They also questioned what value management could add by being there.
- Hourly workers expressed a perception that, with the exception of first line supervisors, management doesn't care about them and they in turn generally distrust management.
- Most hourly workers indicated that they do not believe they are adequately involved in work planning. An exception is with the Fluor Federal Services construction crews and the 222-S Laboratory staff. In these exception cases there also appeared to be good teamwork. In some cases workers indicated that their inputs into planning were ignored.
- During observations of pre-job briefings (with one exception discussed in Section 4.2), hourly workers were observed to be on time for the briefings and attentive. This is an improvement over what some team members observed two years ago during previous ISM reviews.

Interviews with some senior and middle managers yielded observations that were also relevant to this particular assessment.

- Managers were observed to be smart, experienced, and self-motivated and expressed a good partnering relationship with DOE.
- Managers were also observed to be willing to change. While the team notes that there has been improvement in self generated proactive change over the past two years (PERs, Corrective Action Review Board, Independent Assessment Function, and the most recent CR Vault causal analysis), the team considers that change is still too often reactive and driven by external pressure.
- Managers understood MD-038 compensatory measures. However, they were unable to communicate a unified message of specific expectations, significance of the collective incidents subject to this review, or needed changes to assure safe and effective work performance.

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In assessing these interview results, the team considers that managers, above the first line supervisory level, are rarely seen at the worksite by the workforce. Consequently, they are unable to manage the perceptions of the work force and are unable to function as effective change agents. In this regard, the team believes that managers at all levels should spend significantly more time with the work force observing planning and actual performance of work with the goal to understand and remove barriers to safe and effective work performance and coach and mentor specific management expectations. The team observed that management expectations regarding major issues, their significance, and required changes for timely resolution were not consistent and were not conveyed via a simple single unified message of "what needs to change and why." The team considers that such a message should emanate from the TFC President through the line managers and supervisors to the workforce.

The team considers that achievement of full acceptance of the MD-038 compensatory measures and recognition that these new measures can enable rather than hinder work performance will require continued mentoring, as well as, gaining experience with the new packages and action levels during future work performance.

While the team observed first line supervisors effectively engaged in work planning, worker involvement appears to be less than optimal. The TFC should examine those Hanford examples cited as effective as well as changes recently implemented at affiliate sites to better understand how to improve in this area.

The team considers that the TFC should continue to improve their ability to find and fix their own problems and move more from reactive to proactive issue resolution.

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8.0 ANALYSIS OF ASSESSMENT RESULTS AGAINST DESIGNATED CRITERIA

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8.1 Work Planning

Criterion	Met	Partially Met	Not Met	Discussion
The Corrective Action Plan is supported by appropriate causal analyses.	✓			Section 6.7.
The Corrective Action Plan is supported by appropriate common cause analyses.			✓	Section 6.7. Common Cause analysis determined to be inadequate, being redone by the TFC to be completed in November 2004
The Corrective Action Plan has effective corrective actions.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The progress of corrective action implementation for Work Planning is adequate.		✓		The team noted that the corrective action to change the ALARA Planning Procedure to elevate the review and decision on when to use mock-ups for high risk work to the Director level was not accomplished by October 15, 2004. A working draft was available, but publication is scheduled for November 13, 2004.
The Compensatory measures for Work Planning are adequate, implemented and effective.		✓		Further review required. This is a major focus for the March 2005 post-implementation review.

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Criterion	Met	Partially Met	Not Met	Discussion
Program reviews, observations, and interviews demonstrate that the implemented work control process is adequately described by TFC-OPS-MAINT-C-01, Revision F, <i>Tank Farm Contractor Work Control</i> .		✓		Further review required. This is a major focus for the March 2005 post-implementation review.
Worker involvement in work planning is required and is observed to occur.		✓		While the Team observed first line supervisors effectively engaged in work planning, worker involvement appears to be less than effective.
Program reviews, observations, and interviews demonstrate that RWPs, JHAs, and IH Monitoring Plans are sufficient and appropriate for the work being performed.		✓		A review of a number of JHAs currently going through the planning process indicates that they have not yet met the expectations for a job specific and step-by-step analysis of the hazards associated with each step and the specific control needed at that point in the work. It should be noted though, that the work instructions are now showing more detail of work steps and specific hazard controls imbedded into that step.

Concurrence or Non-concurrence with Corrective Actions and Associated Findings

The review team concurs with corrective actions identified in the 244-CR Vault event root cause analysis. However, some deficiencies were identified in the area of work planning.

Finding 1: Worker involvement in work planning appears to be less than optimal.

Finding 2: Job Hazard Analyses reviewed do not provide a job specific, work step analysis of hazards.

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8.2 Conduct of Operations

Criterion	Met	Partially Met	Not Met	Discussion
The Corrective Action Plan is supported by appropriate causal analyses.	✓			Section 6.7.
The Corrective Action Plan is supported by appropriate common cause analyses.			✓	Section 6.7. Common Cause analysis determined to be inadequate, being redone by the TFC to be completed in November 2004
The Corrective Action Plan has effective corrective actions.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.

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Criterion	Met	Partially Met	Not Met	Discussion
The progress of corrective action implementation for Conduct of Operations is adequate.		✓		Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated July 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the current progress on completion of the action items and determined that four of the six due to this point had been completed based upon the due dates in the actual corrective action plan (vice the adjusted due dates being tracked in PERS for some actions).
The Compensatory measures for Conduct of Operations are adequate, implemented and effective.		✓		See Section 5.4. Further review required. This is a major focus for the March 2005 post-implementation review
Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel demonstrate an understanding of the procedure compliance policy.		✓		Further review required. This is a major focus for the March 2005 post-implementation review
Observations show that the use of procedures, work packages, JHAs, RWPs, IH Monitoring Plans and other documents is appropriate and adequate for safe performance of work.		✓		See section 5.7. Further review required. This is a major focus for the March 2005 post-implementation review

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Criterion	Met	Partially Met	Not Met	Discussion
Program reviews show that the conduct of operations program is consistent with the DOE approved Conduct of Operations Applicability Matrix.	✓			The conduct of operations program is consistent with the ORP-approved Conduct of Operations Applicability Matrix included as Attachment A in the <i>Conduct of Operations Implementation Plan</i> , TFC-PLN-05, Rev B-8. The Matrix specifies the contractor's implementing policy documents and procedures as well as specifying the scope of applicability and any deviations for the Chapters in DOE Order 5480.19, <i>Conduct of Operations</i> .
Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.		✓		Further review required. This is a major focus for the March 2005 post-implementation review.
During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.		✓		Further review required. This is a major focus for the March 2005 post-implementation review.

Concurrence or Non-concurrence with Corrective Actions and Associated Findings

The review team concurs with corrective actions identified in the 244-CR Vault event root cause analysis.

8.3 Relevant Management Programs Including Feedback and Improvement

Criterion	Met	Partially Met	Not Met	Discussion
The Corrective Action Plan is supported by appropriate causal analyses.	✓			Section 6.7.
The Corrective Action Plan is supported by appropriate common cause analyses.			✓	Section 6.7. Common Cause analysis determined to be inadequate, being redone by the TFC to be completed in November 2004.
The Corrective Action Plan has effective corrective actions.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.

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Criterion	Met	Partially Met	Not Met	Discussion
The progress of corrective action implementation for Feedback and Improvement is adequate.		✓		Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated July 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the current progress on completion of the action items and determined that four of the six due to this point had been completed based upon the due dates in the actual corrective action plan (vice the adjusted due dates being tracked in PERS for some actions).
The Compensatory measures for Feedback and Improvement are adequate, implemented and effective.		✓		Further review required. This is a major focus for the March 2005 post-implementation review

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Criterion	Met	Partially Met	Not Met	Discussion
Program reviews show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.		✓		The team believes the TFC has partially met the this criteria due to the need to verify all the recent and pending organizational changes are properly documented, implemented and all central program staffs are in place. In addition, the TFC should clarify how technical support personnel interact with the central program staffs to resolve technical issues effecting safety of the work. Further review required. This is a major focus for the March 2005 post-implementation review
Program reviews show that the occurrence reporting process as required by DOE is fully implemented.		✓		Section 6.7. Previously identified deficiency in quarterly trend reporting.
Program reviews show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.		✓		Section 6.7. Based on review of the PER system there has been a trend toward an increasing time to closure for PER Corrective Actions.

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Criterion	Met	Partially Met	Not Met	Discussion
Program reviews and interviews show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. (Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.)	✓			Section 6.7. Critique conduct needs improvement.
Program reviews and interviews show that the Lessons Learned program is effective.		✓		Section 6.7. Existing program needs to be streamlined to facilitate effective use by planners.

Concurrence or Non-concurrence with Corrective Actions and Associated Findings

The team concurs with corrective actions identified in the 244-CR Vault event root cause analysis. However, some deficiencies were identified in the areas of line management responsibility for safety, root cause analysis, and management programs, including feedback and improvement.

- Finding 3: Management expectations regarding major issues, their significance, and required change for resolution were not consistent and were not communicated via a single, simple unified message for "what needs to change and why."
- Finding 4: Some deficiencies were identified with the corrective actions detailed in the 244-CR Vault event root cause analysis.
- Finding 5: The radiological event common cause analysis report transmitted to DOE on September 30, 2004, did not systematically identify which causes were substantially common to a majority of those events, and did not identify the analytical basis for conclusions reached other than through employee interviews.
- Finding 6: The TFC has not corrected the record (formal correspondence) regarding the submission of a radiological event common cause analysis.

- Finding 7: Inadequacies identified in the critique of the CR Vault event were not formally identified, nor were corrective actions taken as a result of the poor critique.
- Finding 8: First line supervisors and their work crews demonstrated weaknesses in level of knowledge in the areas of practical application of radiological controls for ionizing radiation (including fundamentals and limitations); first line supervisors were unable to clearly articulate Conduct of Operations and ISMS attributes.

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9.0 REVIEW TEAM CONCLUSIONS

The team considers that the TFC has identified required improvements in ISM and that the TFC's current path forward can be successful. However, significant management team in-field presence and involvement and worker buy-in will be necessary to achieve improvement objectives.

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10.0 REFERENCES

1. DOE Policy P 450.4, *Safety Management System Policy*, U.S. Department of Energy, October 15, 1996.
2. DOE G 450.4-1B, *Integrated Safety Management System Guide*. U.S. Department of Energy, March 1, 2001.
3. DOE O 425.1C, *Startup and Restart of Nuclear Facilities*. U.S. Department of Energy, March 13, 2003.
4. 48 CFR Chapter 9, *Department of Energy*, 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*. Federal Acquisition Regulations System.
5. 48 CFR Chapter 9, *Department of Energy*, 970.5204-2, *Laws, Regulations, and DOE Directives*. Federal Acquisition Regulations System.
6. 10 CFR 830, *Nuclear Safety Management*, Subpart A, *Quality Assurance*. Department of Energy.
7. 10 CFR 830, *Nuclear Safety Management*, Subpart B, *Safety Basis Requirements*. Department of Energy.

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Appendix A - Team Member Biographies

Frank McCoy: Mr. McCoy has over thirty-five years of experience in the operation, regulation, and management of U.S. DOE, commercial and naval nuclear facilities including power and production reactors, chemical processing facilities, and laboratories. This experience has included management and senior executive positions with DOE, Department of Navy, and the U.S. Nuclear Regulatory Commission (NRC), as well as private sector companies. Currently Mr. McCoy is a Principal with Washington Safety Management Solutions (WSMS) where he is responsible for managing all WSMS services for closure projects. As a WSMS Principal Mr. McCoy has also personally supported many sites in the both the DOE and DoD including: supporting West Valley Nuclear Services Company on deactivation, decontamination and decommissioning activities; supporting the Yucca Mountain Project with ISM development and implementation; supporting Savannah River Site in accident investigations and senior safety reviews; providing nuclear facility management, operational readiness, and ISM consulting services to Bechtel at the Nevada Test Site and Hanford Waste Treatment Plant Project; supporting Oak Ridge National Laboratory in the Operational Readiness Review of the High Flux Isotope Reactor; providing Integrated Safety Management and Quality Assurance assessment services to Rocky Flats Environmental Technology Site and Brookhaven National Laboratory, and providing management support to the Army Chemical Demilitarization facilities at Tooele, Umatilla, and Anniston. Prior to retiring from government service and joining WSMS, Mr. McCoy was a Senior Executive within DOE where his last assignment was serving as Deputy Manager at the Savannah River Site (SRS). In this capacity he served as Chief Operating Officer for SRS nuclear operations. In 1996 and 1997, he served as a Special Assistant to the Under Secretary of Energy where he led the DOE's efforts to establish and implement an Integrated Safety Management System across the DOE complex. Prior to joining DOE, Mr. McCoy was as a manager in NRC where his last assignment was as Assistant Director for Inspection Programs. In this capacity, he was responsible to the NRC's Office of Special Projects for inspection and assessment activities associated with recovery of the five TVA licensed reactors following prolonged shutdown as "watch-listed" problem utilities. While in NRC, his activities also involved leading and/or participating in the Operational Readiness Reviews for NRC operating license approval of the Vogtle, Shero Harris, and Catawba nuclear units. He also performed numerous onsite response inspections of reactor unusual events, routine assessments of licensed operator training, maintenance, and operations programs and participated in Safety System Functional Inspections and Augmented Inspection Team Inspections. During nearly 15 years with the Department of Navy, Mr. McCoy was a Chief Refueling Engineer, Project Manager, and Physicist at the Charleston Naval Shipyard. Mr. McCoy holds a Masters degree in Physics from Georgia Tech and Bachelor of Science degree from The Citadel.

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Joseph Arango: Mr. Arango has sixteen years of experience in various engineering disciplines supporting the development and implementation of program plans for the Department of Energy and the Department of Defense. He holds a Masters degree in Industrial and Systems Engineering from Virginia Tech and a B.S. in Mathematics from the U.S. Naval Academy. Mr. Arango currently works in the DOE EM Headquarters Office of Integrated Safety Management/Operations Oversight. He has led a number of reviews conducted consistent with the Department's line oversight policy, and he has been designated as an Integrated Safety Management System Verification Team Leader. He was the DOE Operational Readiness Review (ORR) Team Leader for the Supernate Process of the TRU/Alpha Low Level Waste Treatment Project startup at Oak Ridge in January 2004. He completed the DOE Operational Readiness Review Training Course for ORR Team Leaders and Team Members in November 2002. From 1995 to 2001, he worked in the Office of the Departmental Representative to the Defense Nuclear Facilities Safety Board on a variety of safety issues identified by the Board including integrated safety management. Mr. Arango also served for two years as the Headquarters Program Manager for the Facility Representative Program guiding Department-wide program implementation and continuous improvement. From 1988 to 1995, as an Acquisition and Engineering Manager in private industry, he provided program management and engineering support for a Navy combat system design and development contract. Prior to 1988, he gained seven years of experience in the Navy nuclear power program where he qualified in submarines and as a Nuclear Engineering Officer and a Nuclear Weapons Handling Supervisor. He participated in Integrated Safety Management System Phase I and II Verifications at Rocky Flats and at the Oak Ridge Y-12 Plant in 1998, as well as a preliminary Phase I Verification at Lawrence Livermore National Laboratory's Building 332. He was the Idaho National Engineering and Environmental Laboratory Verification Team Leader for both the Phase I and the initial Phase II Verification in 1999. He was a sub-team leader for the August 2000 Verification at the Y-12 Plant and he led an Integrated Safety Management System Assessment for the Y-12 Area Office in 2001 and for the Idaho Operations Office in 2002.

Terry E. Krietz: Mr. Krietz is the worker safety and health subject matter expert for the Office of Engineering on detail to the Chief Safety Officer position for the Office of Environmental Management. He has 25 years experience in safety management of highly hazardous operations. Eleven of those years were spent developing DOE-wide worker safety and health policy and providing technical assistance to the DOE field elements. He earned Bachelor of Science degrees in biology and geo-environmental studies at Shippensburg University.

Before coming to DOE, Mr. Krietz served as Safety Director at the Sierra Army Depot and the Senior Safety Manager for the U.S. Army Depot System Command. He completed the U.S. Army Materiel Command Safety Management Intern Program and technical training in the chemical, explosives, nuclear, and radiological areas. Mr. Krietz has served as lead, co-lead, or participant on over 40 comprehensive safety and health program evaluations of U.S. Army Depot System Command installations. He has also been accident investigation board chairman for fatality investigations at Anniston and Tobyhanna Army Depots. He

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has been the lead, co-lead, or participant on pre-operational surveys of toxic chemical weapon operations at Anniston, Blue-Grass, Pueblo, Tooele, and Umatilla Army Depots, and has been the lead for Army safety and health inspections of industrial, explosives and construction operations at U.S. Army Depots. With DOE, he has served as an evaluator for the DOE Voluntary Protection Program evaluations at Savannah River and INEEL and has been an evaluator for DOE EH/EM reviews of site safety and health programs. Terry has participated in ISMS reviews and re-verifications at the DOE Office of River Protection, CH2MHill Hanford Group Tank Farm and Bechtel National Waste Treatment Plant at Hanford, the Oak Ridge Operations Office/Bechtel-Jacobs ETTP; and the DOE Savannah River Oversight Review of Westinghouse Savannah River Company ISMS review.

Bill Lloyd: Mr. Lloyd brings over 20 year of experience in the operation of nuclear facilities. He is degreed in Chemical Engineering from Illinois Institute of Technology. Mr. Lloyd began his career as an operator in the nuclear power industry. This experience includes initial startup of both Boiling Water Reactor (GE) and Pressurized Water Reactor (W) operations. In addition to qualification as a nuclear operator, he also qualified as a radiation- chemistry technician. These positions allowed Mr. Lloyd to become intimately familiar with all facets of power plant operation. These include reactor power operations, radwaste operations, health physics, radiation safety and reactor and secondary water chemistry.

Mr. Lloyd has also worked in the Nuclear Weapons Complex. He has extensive experience in Nuclear Materials processing. Mr. Lloyd was integral to implementing the restart (after a six-year shutdown) and continuous safe operation of this plutonium manufacturing, stabilization, packaging and storage facilities. These facilities converted Plutonium nitrate solution into a Plutonium Metal product. This product is then processed into a weapon useable form. In this capacity, Mr. Lloyd had fully authority and accountability for all operations and for all materials. Mr. Lloyd also has extensive experience in the area of Material Protection Control and Accountability (MPCA) as well as Safeguards and Security (S&S).

Mr. Lloyd has demonstrated a keen sense of scheduling, planning, budget management, Authorization Basis management and the effects of plutonium, highly enriched uranium, americium and other special nuclear material. He has a proven ability to get things safely done within budget caps and with imagination, leadership and intelligence.

Mr. Lloyd has also acted as a Senior Advisor in the area of operations at Los Alamos National Laboratory. In the capacity, he advised the Associate Director for Weapons Engineering and Manufacturing (ADWEM) in the area of operations improvement. These duties included the areas of Plutonium processing and Tritium processing for weapons development and life extension issues.

John R. Longenecker: Mr. Longenecker has over 30 years experience in the energy industry in the areas of independent assessment, project management and regulatory compliance in various programs including waste management, nuclear reactor development,

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and advanced technology development and deployment. Unique strengths and experience include independent assessment, strategic planning, regulatory compliance, nuclear safety, and quality assurance.

Mr. Longenecker's energy related experience includes performing strategic planning, technical and management assessments of nuclear fuel cycle projects and facilities including the Hanford site, Yucca Mountain High Level Waste Project, the Idaho Spent Fuel Project, and the Tank Waste Remediation System Project (TWRS). In 2000, Mr. Longenecker and several Longenecker & Associates staff served as members of a DOE review of the TWRS project that was mandated by Congress. Mr. Longenecker also serves as Managing Director and Working Group Coordinator of the DOE's Energy Facilities Contractors Operating Group (EFCOG).

Mr. Longenecker experience with DOE programs includes serving on review and advisory panels at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, the Yucca Mountain Project, Fluor Hanford and the Office of River Protection, and performing quality assurance management assessments from 1990-2002 for DOE's Office of Civilian Radioactive Waste Management, including the Yucca Mountain High Level Waste Project. Mr. Longenecker was appointed by President Bush in December 1992 to serve as Transition Manager for the United States Enrichment Corporation, a government owned, for-profit corporation that provides uranium enrichment services to electric utilities throughout the world.

In the area of commercial nuclear power, Mr. Longenecker has served as a member of the Board of Directors of the Nuclear Energy Institute. In addition, from 1997-1999 Mr. Longenecker assisted Ontario Hydro Nuclear in developing and implementing a more effective regulatory compliance strategy for their 20 nuclear power plants.

Prior to the formation of Longenecker & Associates in May 1989, Mr. Longenecker was Chairman of General Atomics International Services Corporation (ISC) in La Jolla, California. ISC provided operational and quality support services to electric utilities and other private sector customers throughout the world. Mr. Longenecker joined General Atomics as Director of Special Projects in August 1987.

From 1983 to 1987 Mr. Longenecker served in the Reagan administration as the Deputy Assistant Secretary for Uranium Enrichment in the U.S. Department of Energy. Prior to managing the U.S. uranium enrichment enterprise, Mr. Longenecker held other management positions in DOE and its predecessor agencies, including serving from 1981 to 1983 as the Program Manager for the CRBRP Project. In this position, Mr. Longenecker was the primary interface with the NRC during the project licensing process.

Mr. Longenecker has appeared before the Congress of the United States on numerous occasions, and has presented papers in various national and international forums. Mr. Longenecker is a member of board of directors of the Nuclear Energy Institute, and has served as chairman of the USCEA Uranium Enrichment Task Force. Mr. Longenecker is a member

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of Tau Beta Pi Honorary Engineering Society, the American Nuclear Society, and the University Club.

Mr. Longenecker received both his Bachelor of Science and Master of Science degrees, with academic honors, from the Pennsylvania State University, and has served as a member of the Penn State Industrial Professional Advisory Council.

Mark Brown: Mr. Brown has over 21 years experience with nuclear operations and providing oversight of environmental restoration activities. Mr. Brown's professional involvement included supervision of U.S. Navy nuclear reactor and steam plant operations, maintenance and overhaul, and oversight and assessment of operating Department of Energy non-reactor nuclear facilities. Mr. Brown holds a Bachelor of Science degree in Mathematics from the University of Texas.

Mr. Brown's career included over eleven years as a naval nuclear submarine officer where he qualified for and supervised the operations of 5 different naval reactor plants, with two years as the lead instructor in the operation of naval reactor and steam plants. Mr. Brown's career with the Department of Energy has included one year evaluating Hanford contractor training and qualification programs, and over 8 years as a Facility Representative for the Office of River Protection. Mr. Brown has extensive experience in conducting assessments of nuclear operations. He has been a review team member for several readiness assessments and operational readiness reviews, and a team leader for several major assessments of Hanford contractors in areas including maintenance, construction, training and operations. Mr. Brown is an NQA-1 certified lead auditor.

Gregg C. Doss: Mr. Doss has been employed at the Hanford Site for 11 years as a Senior Health Physics Technician. For the last 3 years he has also been appointed as a Union Safety Representative for Hanford Atomic Metals Trade Council (HAMTC.) in Waste Feed Operations. As a HAMTC Safety Representative, Mr. Doss received training in Principles of Accident Investigation, Operations Managers' Safety Training, Audit Training, OSHA Record Keeping Rule Training, and Event Investigations and Root Cause Analysis Training. He is currently pursuing a Health and Safety Certification from the Region X OSHA Training Institute.

His functions as a HAMTC Safety Representative include:

- Assisting DOE and contractors in resolving HAMTC employee concerns related to health and safety
- Working with Labor Relations, the Employee Concerns Program, and the Employee Response Team to resolve work place issues
- Serving as the point of contact for *Stop Work*, *Work Pause*, fact findings, event investigations or other activities where HAMTC employees are involved
- Participating in management staff meetings to aid in resolving health and safety issues

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- Participating and seeking worker involvement in the health and safety programs, such as Safety Councils, Integrated Safety Management, VPP, and the Safety EXPO.

Prior to coming to the Hanford Site, Mr. Doss served six years and was honorably discharged from the U.S. ARMY National Guard Reserve, holding the position of Tank Commander/Asst. Platoon leader Grade E-6. While in the Army, he completed the Non Commissioned Officer's School, advanced training in primary leadership development, and trainer instructor courses. Mr. Doss attended Columbia Basin College where he earned an Associate Degree in Nuclear Technology. He also earned a 22-month certification in welding technologies from the Job Corps Conservation Center.

Susan Coleman: Ms. Coleman has over 25 years experience in the areas of program/project management, security, and document production, as evidence during assignments with the U.S. Department of Energy Hanford Site and U.S. Navy/Naval Reserve (CTACS, Retired). Ms. Coleman has a Bachelor of Science degree in Business Administration (with a Labor Relations concentration) from Bowie State University. Due to knowledge and/or extensive experience in numerous areas of the DOE Office of River Protection mission, Ms. Coleman currently supports the Manager's Office and senior management team in various capacities, such as, developing technical reports and documents, and facilitating closure of a wide range of technical activities; as an experienced technical expert in the area of Security she supports the ORP Security Point of Contact in the oversight of the DOE program and prime contractors, CH2M HILL Hanford Group, Inc. responsible for the Hanford Site tank farms, and Bechtel National, Inc. responsible for the design, construction and commissioning of a vitrification plant. She is an advisor to the DOE Federal Technical Capability Panel Chairman and Panel, which is responsible for overseeing, developing, implementing, and/or resolving issues related to recruiting, developing, and retaining technical capability within DOE. In 1999, Ms. Coleman participated on a team to successfully place a contract valued at \$6.5 billion to develop a Waste Treatment Complex and the team negotiating an extension of the current Tank Farms contract. From 1986 to 1999, Ms Coleman supported the organization responsible for integrating activities between DOE and the two prime contractors, CH2M HILL and BNFL, Inc., and the \$9M Single-Shell Tank Program, responsible for the technical activities for waste retrieval, technology demonstration, tank farm closure, tank leak contamination studies and corrective measures including reviewing authorization basis documents and developing evaluation reports; necessary to continue safe operation of the Hanford Site Tank Farms. From 1995 to 1996, Ms. Coleman supported the team responsible for developing the initial Request for Proposals (RFP) provided to commercial industry to build the nations largest vitrification facility to treat nuclear waste. From 1994 to 1995, Ms. Coleman coordinated the DOE Standards/Requirements Identification Document (S/RID) project, which developed a comprehensive document that included the environmental, health and safety requirements necessary to manage the Hanford Site. During 1993, Ms. Coleman was Project Lead of a group responsible for identifying historical information relevant to the "Downwinders" class-action lawsuits; which charged deleterious health effects to people in the Hanford vicinity during the period 1944 to 1947

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

From 1977 to 1997, Ms. Coleman was a Cryptologic Technician Administrative, Senior Chief Petty Officer (Retired) with the U. S. Naval Security Group (1977-1986) and U.S. Naval Reserve Security Group (1986-1997). She was responsible for administrative, personnel, training, procurement, and security (physical, information, personnel) areas of the organization. In 1994, she was the Senior Enlisted Advisor for the Pacific Northwest region responsible for personnel/organizational issues associated with personnel in the States of Washington, Idaho, and Oregon. Due to her experience in the area of Security, Ms. Coleman developed a Naval Reserve Security Group Program manual governing information/personnel security and records management programs guidance for security professionals. Also during late 1993 to early 1994, she returned to active duty temporarily to manage the ~2000 person nationwide U.S. Naval Reserve Security Group Program, and during 1989, she returned to active-duty to prepare a comprehensive site *Emergency Action Plan* that identified the physical security/counter-terrorism needs and plans (submitted to the United States Congress) for an active site in Germany. In recognition of her efforts she has received numerous commendations for superior performance.

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

Appendix B - List of Interviewee Positions

WORKERS (21)

Nuclear Chemical Operator (11)
Construction Craft (10)

SUPERVISORS (20)

FWS (20)

TECHNICIANS (26)

RCT (9)
IH Technicians (5)
QA Inspector (1)
Planners (8)
Instrument Technicians (3)

ENGINEERS AND MANAGERS (36)

Waste Feed Operations Facility Operations Director
Waste Feed Operations Shift Operations Director
Closure Project Facilities Director
Closure Project Radiological Control Director
Closure Support Technical Specialist
Closure Project Facilities Manager
Laboratory Facilities Director
ATS Radiological Control Director
222-S Laboratory Analytical Services Manager
Corrective Action Program Manager
Training and Procedures Manager
Executive Assistant to the President
Waste Feed Operations IH
SSW (10)
Shift Operations Managers (3)
Waste Feed Operations Radiological Control Director
Director, Safety and Health
Director, Work Planning
Manager, Employee Concerns
Senior Director, Safety Programs
Manager, Closure Project IH
Director, Environmental Health
Occupational Safety Specialist (2)
Waste Feed Operations Conduct of Operations Compliance Officer

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

SENIOR MANAGEMENT (7)

President and General Manager

Senior Vice President, Nuclear Operations

Vice President, Waste Feed Operations

Vice President, Closure Operations

Vice President, Analytical Technical Services

Vice President, Performance Assurance

Vice President, Project Delivery

DOE FACILITY REPRESENTATIVES AND DOE MANAGEMENT (5)

Facility Representatives (4)

Acting Assistant Manager, Tank Farms Project

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

Appendix C - Documents Reviewed

1. Action Tracking Status Report for PER-2004-4057, Corrective Action Plan for 244-CR Vault Thermocouple Event, dated October 27, 2004
2. Assessment Report FY-2004-CH3M-I-0126, Rev. 1, April 2004 *Independent Assessment of CH2MHILL Hanford Group, Inc., Radiological Controls ALARA Program, Radiological Work Planning, and Field Implementation of Radiological Controls*
3. Assessment FY-2004-CH2M-I-0034, Draft September, 2004, *Independent Assessment of CH2MHILL Hanford Group, Inc., Closure Project and Radiological Training*
4. ATS-MD-1015, Rev 4, Compensatory Measures for Radiological Hazard Control Performance, dated September 14, 2004
5. Briefing materials regarding Summary of Five Recent Events with Common Failure Modes to the July 22, 2004, 244-CR Vault Thermocouple Removal Event, dated August 11, 2004
6. Briefing materials on Common Cause Analysis of Recent Radiological Control Events, dated October 18, 2004
7. Causal Analysis Report for 244-CR Vault Thermocouple Removal dated September 22, 2004
8. *CH2M HILL Hanford Group Common Cause Analysis of Radiation Control Events*, Final Report September 30, 2004
9. *CH2M HILL Occurrence Reporting Management Assessment*, dated July 21, 2004
10. CH2M HILL General Delivery Message 04-302, *Meeting Free Day*, dated October 12, 2004
11. Corrective Action Plan, Attachment J from Causal Analysis Report, dated September 22, 2004
12. CP Daily Reports
13. Daily Operations Report for Plan of the Day meeting dated October 26, 2004
14. DOE EM Headquarters letter to the DNFSB dated October 22, 2004 regarding ISMS for the Hanford Tank Farms
15. DOE Facility Representative email from Courtney Blanchard, DOE-ORP, *CR Vault Procedure Vio—Similar Events*, dated September 2, 2004
16. DOE-NE-STD-1004-92, *Root Cause Analysis Guidance Document*
17. DNFSB letter to EM Headquarters dated September 8, 2004 with 60-day reporting requirement on weaknesses in the ISM System for the Tank Farms

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

18. Fiscal Year 2004 – Lessons Learned Program Performance Assessment, CH2M HILL report 7X500-NJM-04-013
19. Form A-6003-707, Work Package Planning Checklist, dated October 2004
20. Integrated Safety Management System Assessment for ORP Final Report dated August 2004
21. Lessons Learned Bulletins, IB-04-41, 42, and 43, 244-CR Vault Thermocouple Removal, dated October 13, 2004
22. Lessons Learned Bulletins IB-04-46 dated 10/20/04, IB-04-45 dated 10/18/04, IB-04-41 dated 10/13/04, IB-04-40 dated 10/13/04, IB-04-43, dated 10/13/04, IB-04-42, dated 10/13/04 *The Causal Analysis Report, 244-CR Vault Thermocouple Removal; Extremity Administrative Control Level Exceeded*, dated September 22, 2004
23. Significant PER-2004-2900 on Work Planning Assessment Results
24. TFC-ESHQ-Q_ADM-C-11, *Root and Common Cause Analysis and Corrective Action Planning*
25. TFC-ESHQ-Q_C-C-02, *PER Tracking Data and Trending Analysis Program*
26. TFC-ESHQ-RP_ADM-C-11, *ALARA Joint Review Group*, Rev A-4
27. TFC-ESHQ-RP_RWP-C-03, *ALARA Work Planning*, Rev D-6
28. TFC-ESHQ-RP_RWP-C-04, *Radiological Work Permits*, Rev C
29. TFC-ESHQ-S_SAF-C-02, *Job Hazard Analysis*, Rev B-2
30. TFC-ESHQ-S_SAF-C-04, *Stop Work Authority*, Rev. B-3
31. TFC-MD-038 *Compensatory Controls for Radiological Control Performance*, Revs D-4; D-5; D-6
32. TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, Rev F,
33. TFC-OPS-MAINT-C-02, *Pre-Job Briefing*, Rev B-1
34. TFC-OPS-MAINT-D-01.1, *Work Planning Guidance*, Rev B
35. TFC-OPS-OPER-C-14, *Event Investigation Process*
36. TFC-OPS-OPER-D-25, *Occurrence Reporting Guidance*
37. TFC-PLN-05, Rev B-8, *Conduct of Operations Implementation Plan*, dated March 17, 2004
38. Occurrence Report RP-CHG-TANKFARM-2003-0058, *Operating Experience Demonstrated Insufficient Training of Operating Staff*, dated December 10, 2003
39. Occurrence Reports RP-CHG-TANKFARM-2004-0006, -0027, -0055
40. ORP Manager letter to CH2MHILL President dated August 25, 2004 regarding Conditional Payment of Fee Determination

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

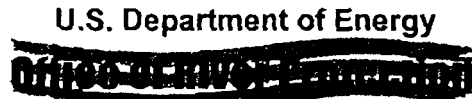
41. PER Performance Indicator reports on open ESTARS actions associated with PERs, PER Cycle Time, PER Cycle time for PER Closure
42. PERs: 2004-2301, 2004-4585, 2003-4632, 2004-2593, 2004-2882, 2003-4736, 2004-2837, 2004-2839, 2004-0596
43. PER Search results for Work Planning issues
44. Planning Resource Center (Intranet webpages)
45. Problem Evaluation Request, PER-2003-4736, S-112 Retrieval Pumping Event, Closure Report dated July 23, 2004
46. Problem Evaluation Request, PER-2004-3122, Radiological Conduct of Operations Discrepancies, In Process Report dated June 10, 2004
47. Work Instructions with associated RWP and JHA (6)
48. DOE letter from Paul M. Golan, EM-1 (Acting), to John T. Conway, Chairman, DNFSB, dated October 22, 2004

Report on the Pre-implementation Portion of the ISM Improvement Validation at the Hanford Tank Farm

Appendix D - Evolutions Observed

Pre-job Briefings (3)
Closure Project Tailgate Meetings (2)
Planning Meetings (4)
ALARA Joint Review Group Meeting (1)
Plan of the Day Meetings (3)
244-CR Post Fieldwork Debrief

Enclosure 2



P.O. Box 450, MSIN H6-60
Richland, Washington 99352

MAR 28 2005

05-TF-003

Mr. E. S. Aromi, President
and General Manager
CH2M HILL Hanford Group, Inc.
Richland, Washington 99352

Dear Mr. Aromi:

CONTRACT NO. DE-AC27-99RL14047 – SUBMITTAL OF THE POST-IMPLEMENTATION
PORTION OF THE INTEGRATED SAFETY MANAGEMENT (ISM) IMPROVEMENT
VALIDATION AT THE HANFORD TANK FARM, FINAL REPORT

The attached Report of the "Post-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm, Final Report," dated March 28, 2005, is provided to CH2M HILL Hanford Group, Inc. (CH2M HILL).

The report concludes that CH2M HILL has substantially completed corrective actions associated with the 244-CR Vault Event that occurred in July 2004, as well as actions associated with the Consolidated Corrective Action Plan, which includes those actions resulting from a common cause analysis of significant events that occurred from June 2003 through November 2004. The report also concludes that CH2M HILL is beginning to realize the benefits of corrective action implementation.

The review team identified no Findings. However, several Observations are provided in the report. CH2M HILL is expected to make appropriate improvements to processes, procedures and practices based on the Observations provided. CH2M HILL has made significant improvements to ISM over the past several months, primarily due to thorough event analyses, diligent corrective action plan development, and focused effort to implement the corrective actions. In many cases, the improvements have been recently implemented and are in their infancy. It is critical that CH2M HILL strives for sustained improvement in ISM to ensure effectiveness of the corrective actions and to ensure future success.

If you have any questions, you may contact me, or your staff may contact T. Zack Smith, Acting Assistant Manager for Tank Farms, (509)372-9735.

Sincerely,


Roy J. Schepens
Manager

TF:MCB

Attachment

cc: See page 2

Mr. E. S. Aromi
05-TF-003

-2-

cc w/attach:

D. I. Allen, CH2M HILL
R. A. Dodd, CH2M HILL
R. L. Higgins, CH2M HILL
V. M. Pizzuto, CH2M HILL
J. A. McDonald, CH2M HILL
P. M. Golan, EM-2
M. J. Weis, Acting EM-3
P. M. Bubar, EM-3.2
M. T. Sautman, DNFSB
R. Quirk, DNFSB

**Attachment
05-TF-003**

**Report of the Post-Implementation Portion of the Integrated Safety Management
Improvement Validation at the Hanford Tank Farm**

(66 pages total,
including coversheet)